

SERVICE MANUAL

24KH12W

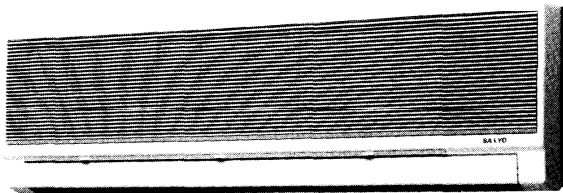


SPLIT SYSTEM AIR CONDITIONER

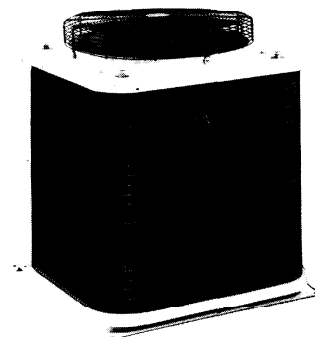
Jul. 1989

Indoor Unit

Outdoor Unit



KH2412W



CH2412

Table of Contents

	Page
1. SPECIFICATIONS	1
1) Unit Specifications	1
2) Major Component Specifications	2
3) Other Component Specifications	3
2. OPERATING RANGE	5
3. CONSTRUCTION OF THE UNIT	6
4. DIMENSIONAL DATA	7
5. CAPACITY	8
1) COOLING CAPACITY	8
2) HEATING CAPACITY	10
6. AIR THROW DISTANCE CHART	12
7. PERFORMANCE CHART	13
8. OPERATING INSTRUCTIONS	19
Controls and Indicators	19
Operation Thumbnails	20
Operation	21
1) "Carefree" Operation	21
2) Cooling	22
A. Manual Cooling	22
B. Energy Saving Mode	23
B1. Energy Saver mode in cooling	23
B2. Night Setback mode in cooling	23
3) Adjusting the Fan Speed	24
A. Automatic	24
B. Manual	24
4) Fan Only	25
5) Using the Timer	25
A. TIMER OFF Mode	25
B. TIMER ON Mode	25
6) Heating	26
A. Manual Heating	26
B. Energy Saving Mode	27
B1. Energy Saver mode in heating	27
B2. Night Setback mode in heating	27
7) Adjusting the Air Flow Direction	28
A. Horizontal	28
B. Vertical	28
Care and Cleaning	29

9. FUNCTION	30
1) Temperature Control	30
2) Energy Saver Modes Timing Chart	32
3) Night Setback Modes Timing Chart	33
4) Auto Modes	34
5) Freeze Prevention (Cooling)	36
6) Outdoor Fan Speed Control	36
7) Overload Prevention (Heating)	37
8) Cold Draft Prevention (Heating)	38
9) Defrosting Mode (Heating)	39
10. INSTALLATION INSTRUCTIONS	41
1) Piping Length	41
2) Installation Site Selection	41
3) Connecting Pipes between Indoor and Outdoor Units	43
4) Insulation of Refrigerant Piping	43
5) Wiring Instructions	43
6) Air Purging	44
7) Trial Run	47
11. REFRIGERANT FLOW DIAGRAM	48
12. ELECTRICAL DATA	49
● Schematic Diagram	49
● Electrical Wiring Diagram	50
● Electrical Characteristics	51
● P.C.B. Ass'y (Printed Pattern)	52
13. TROUBLESHOOTING	53
14. CHECKING AND REPLACING ELECTRICAL COMPONENTS	67
15. DISASSEMBLY PROCEDURES	75
16. PARTS LIST	82

1. SPECIFICATIONS

1) Unit Specifications

Model No.		24KH12W	
Unit Model No.	Indoor unit	KH2412W	
	Outdoor unit	CH2412	
PERFORMANCE		Cooling	Heating
Capacity	BTU/hr.	22,000 / 21,600	23,400 / 23,000
Air circulation (High)	cu. ft. /min.	540 / 510	
Moisture removal (High)	Pints/hr.	6.4 / 6.3	
ELECTRICAL RATING			
Frequency	Hz	60	
Phase		Single	
Voltage rating	V	230 / 208	
Available voltage range	V	187 ~ 253	
Running amperes	A	10.5 / 11.4	11.5 / 12.8
Power input	W	2,400 / 2,350	2,550 / 2,550
Power factor	%	99 / 99	96 / 96
S. E. E. R.	BTU/Whr.	9.0 / 9.1	2.70 / 2.60 (COP)
Heat element	kW - HSPF	-	1.8 / 1.47 - 6.6 / 6.6
FEATURES			
Controls		Microcomputer	
Control switch		Remote control	
Temperature control		IC Thermostat	
Timer		ON/OFF , 12-hours	
Fan speeds	Indoor fan / Outdoor fan	3 / 1	
Air deflection	Horizontal / Vertical	Manual / Manual	
Air filter		Washable, easy access	
Compressor		Rotary	
Refrigerant (R-22) amount		lbs. (kg)	
Refrigerant control		Capillary tube	
Operation sound	In-Hi/Me/Lo	dB-A	45 / 42 / 40
	Out-Hi	dB-A	52
Refrigerant piping connections		Flare type	
Max allowable piping length at shipment		ft. (m)	
Limit of piping length		ft. (m)	
Max. elevation difference between two units		ft. (m)	
Refrigerant pipe diameter o.d.	Narrow pipe	in. (mm)	1/4 (6.35)
	Wide pipe	in. (mm)	5/8 (15.88)
Refrigerant piping kit		Optional	
Accessories		Hanging wall bracket	
DIMENSIONS & WEIGHT		Indoor unit	Outdoor unit
Height	in. (mm)	14-9/16 (370)	30-1/8 (765)
Width	in. (mm)	49-7/32 (1,250)	26-3/8 (670)
Depth	in. (mm)	8-9/32 (210)	26-3/8 (670)
Net weight	lbs. (kg)	44 (20)	185 (84)
Shipping volume	cu. ft. (cu. m)	6.9 (0.195)	16.3 (0.461)
Shipping weight (Approx.)	lbs. (kg)	57 (26)	202 (92)

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Remarks: Rated conditions : Cooling, Outdoor unit entering air temperature 95°F D.B./75°F W.B.
Indoor unit entering air temperature 80°F D.B./67°F W.B.
Heating, Outdoor unit entering air temperature 47°F D.B./43°F W.B.
Indoor unit entering air temperature 70°F D.B.

2) Major Component Specifications

Unit Model No.	KH2412W
Controller P.C.B.	POW-K243GH
Control circuit fuse	250V - 3A
Remote control unit	RCS-KH2412W / RCS-KH2412X
Electric heater	AH-KH2412
Heater element	230V 600W × 3

Unit Model No.		CH2412	
Defrost controller		POW-C243GH	
Compressor		Hermetic Rotary Type	
Compressor model No.		C-R170H6S	
Source		230/208V, 60Hz, Single phase	
Pole		2	
Nominal output W(H. P.)		1,700 (2-1/4)	
Compressor oil cc		1,350 (Special oil for Rotary Compressor)	
Coil resistance (Ambient temp. 77°F)		C - R : 0.73 C - S : 1.91	
Protective Devices, Compressor		Internal line type	-
Overload relay model		-	-
Operating temp.	Open °F	320 ± 9	-
	Close °F	198 ± 20	-
Operating amperes (Ambient temp. 77°F)		-	-
Run capacitor	μF	35	
	VAC	400	
Crankcase heater V - W		230 - 30	

Unit Model No.	KH2412W	CH2412
Fan	Cross-flow	Propeller
Number....dia. (length) mm	1.... ϕ 110, (L990)	1.... ϕ 500
Fan motor model	KFH4Q-31A6P	KFC8S-101A6P
Source	230/208V, 60Hz, Single phase	
No. of pole....rpm. (230/208V)	4....1,272/1,180(Hi.)	8....827/809
Nominal output W	30	100
Coil resistance (Ambient temp. 68°F) Ω	WHT - BRN : 210.4 ORG - YEL : 424.9 WHT - VLT : 45.5 VLT - ORG : 25.8 ORG - PNK : 114.4	WHT - BRN : 24.2 BLK - PNK : 53.1
Safety Devices		
Fan motor, internal type	Open °F	248 ± 9
Operating temp.	Close °F	171 ± 27
Run capacitor	μF	1.8
	VAC	440

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

3) Other Component Specifications

Relay (Heater relay)	G4E-2123T-US
Coil rated	DC 24V
Coil resistance Ω (at 68 °F)	533 \pm 15%
Contact rated (2a)	AC 240V : 15A
Unit Model No.	KH2412W

Relay (Fan motor relay)	MY2F-T1-USTS
Coil rated	AC 240V
Coil resistance $k\Omega$ (at 68°F)	18.8 \pm 15%
Contact rated (2c)	AC 240V : 5A
Unit Model No.	CH2412

Magnetic Contactor	FMCA-1UL
Coil rated	60Hz AC 240V
Coil resistance Ω (at 68°F)	580 \pm 15%
Main Contact (3NO)	AC 240V : FLA 20A LRA 120A
Auxiliary Contact (1NO,1NC)	AC 220-240V : 3A
Unit Model No.	CH2412

Thermister (Indoor coil temp. sensor)	PTC-51H-S3
Resistance $k\Omega$	32°F 185.5 \pm 5% 86°F 45.1 \pm 5% 50°F 112.2 \pm 5% 104°F 29.7 \pm 5% 68°F 70.1 \pm 5% 122°F 20.0 \pm 5%
Unit Model No.	KH2412W

Thermistor (PTC)	TDK 101YV
Rated max. voltage	AC 400V
max. ampere	11.5A
Resistance Ω (at 77°F)	100 \pm 25%
Unit Model No.	CH2412

Transformer	ATR-J122U
Rating	AC 220V 60HZ
Primary	19V 0.63A
Secondary	12VA
Capacity	Primary (WHT - WHT): 143.5
Resistance Ω	Secondary (BRN - BRN): 1.2
(Ambient temp. 79 °F)	259 °F 2A 250V
Thermal Cutoff	
Unit Model No.	KH2412W

Other Component Specifications

Thermostat (Defrost thermo.)	TRS02-12MSR316
Operating Temps. °F	ON 54 ± 4 DIFF. 14 below
Contact rated	AC 120V 0.5A
Unit Model No.	CH2412

Thermostat (Fan speed control)	YTB-4U305F
Operating Temps. °F	OFF 79 ± 3 ON 75 +3, -1
Contact rated	AC 200/240 : FLA 1A LRA 6A
Unit Model No.	CH2412

Solenoid Valve (4-way valve)	L27 9072(Coil) , V26 9000(Valve)
Rating	AC 208/230V , 60HZ , 5W
Coil resistance Ω (at 68 °F)	1.050
Unit Model No.	CH2412

Heater Protector

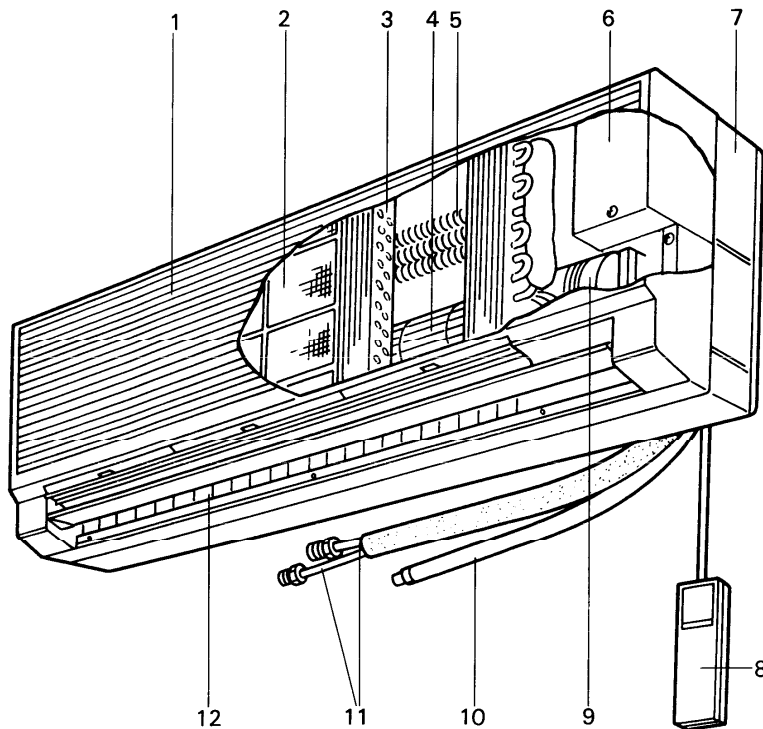
Unit Model No.	Thermostat			Fuse
KH2412W (AH-KH2412)	S397	Rating	AC 240V , 15A	SF188U
		Operating Temps.	OFF 140 ± 5°F	Cutoff 370 +2, -5°F
			ON 113 ± 9°F	

2. OPERATING RANGE

	Temperature	Indoor air intake	Outdoor air intake
Cooling	Maximum	95°F DB/71°F WB	115°F DB
	Minimum	67°F DB/57°F WB	67°F DB
Heating	Maximum	80°F DB/67°F WB	75°F DB/65°F WB
	Minimum	- DB/ - WB	17°F DB/15°F WB

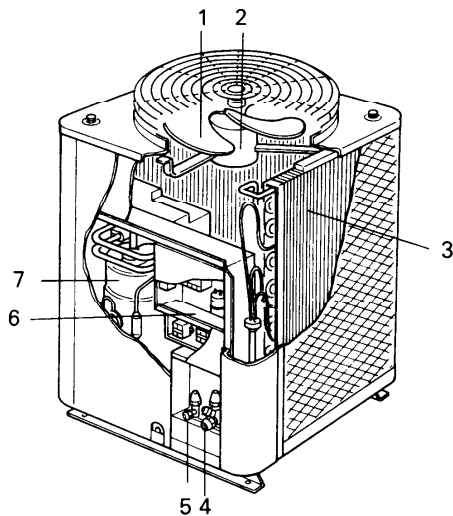
3. CONSTRUCTION OF THE UNIT

Indoor Unit KH2412W



1. Air intake
2. Air filter (Slide-out)
3. Evaporator (= Indoor heat exchanger)
4. Indoor fan
5. Heater ass'y
6. Electrical component box
7. Casing
8. Remote control unit
9. Fan motor
10. Drain hose
11. Refrigerant piping
12. Air outlet

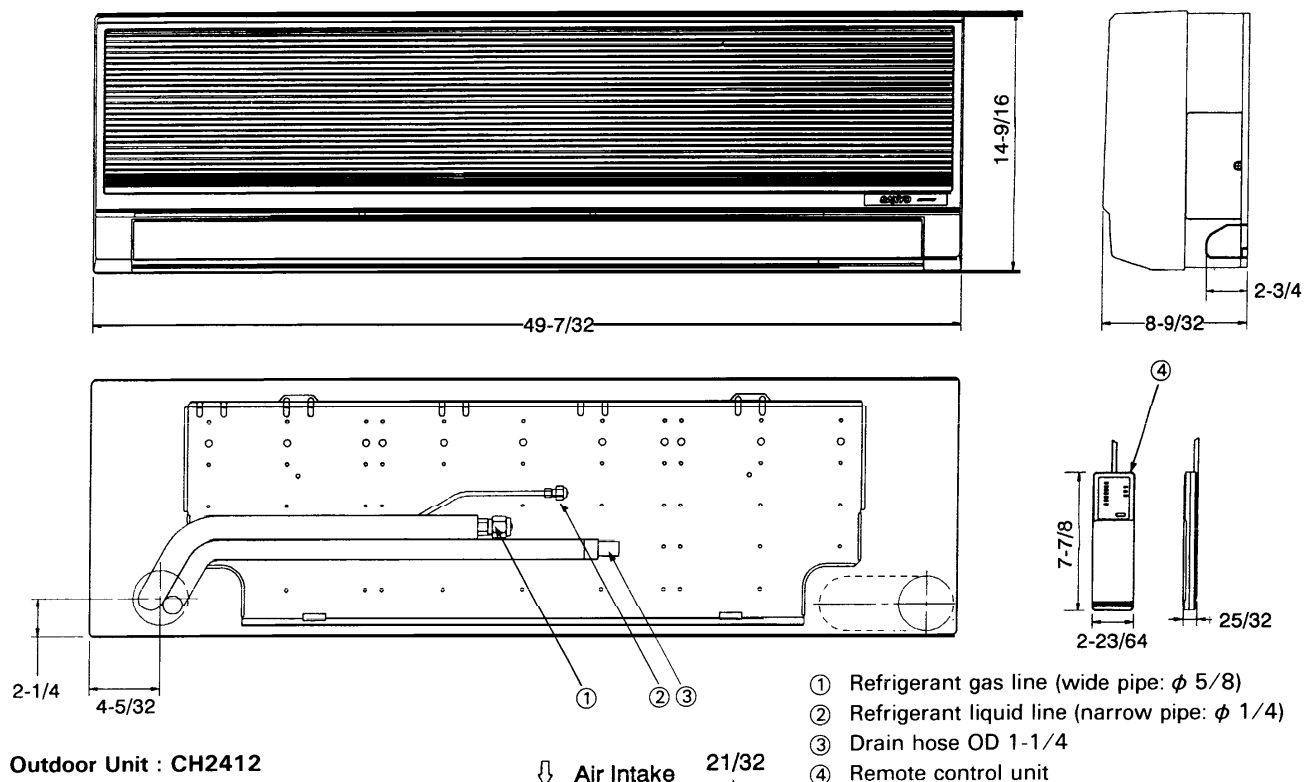
Outdoor Unit CH2412



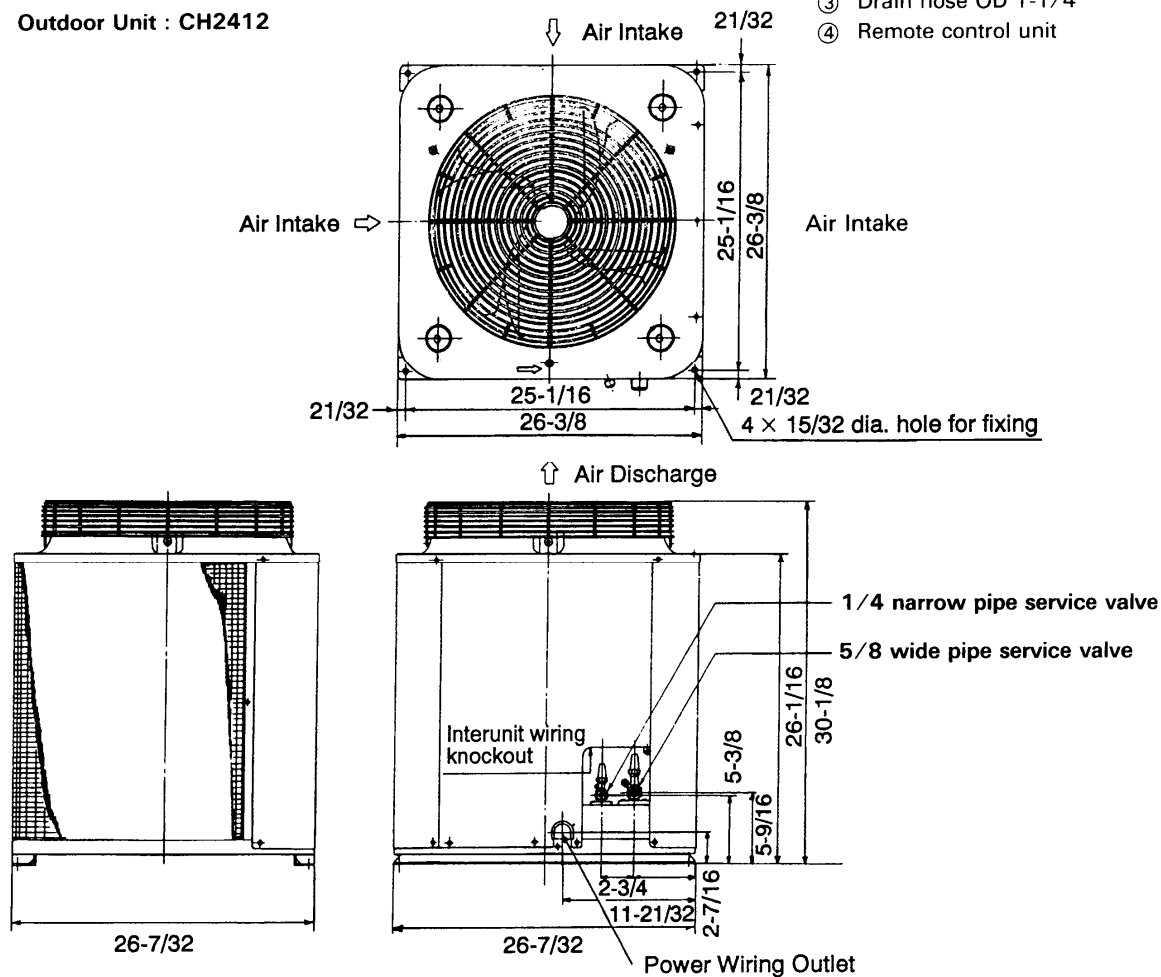
1. Propeller fan
2. Fan motor
3. Condenser (= Outdoor heat exchanger)
4. Service valve (Wide pipe)
5. Service valve (Narrow pipe)
6. Electrical component box
7. Compressor

4. DIMENSIONAL DATA

Indoor Unit : KH2412W



Outdoor Unit : CH2412



5. CAPACITY

1) COOLING CAPACITY

1PHASE 60Hz 230 V

MODEL NAME : 24KH12W

RATED CAPACITY : 22,000 BTU/H AIR FLOW RATE : 540 CFM							
EVAPORATOR		CONDENSER					
ENTERING TEMP °F(°C)		AMBIENT TEMP °F(°C)					
W.B	D.B		75(23.9)	85(29.4)	95(35)	105(40.6)	115(46.1)
59 (15.0)		TC KW	21,780 1.70	20,790 1.85	19,800 2.02	18,680 2.18	17,160 2.40
	72 (22.2)	SHC	15,590	15,070	14,560	14,000	13,250
	76 (24.4)	SHC	17,490	16,970	16,460	15,890	15,150
	80 (26.7)	SHC	19,470	18,950	18,440	17,880	17,130
	84 (28.9)	SHC	21,360	20,790	19,800	18,680	17,160
	88 (31.1)	SHC	21,780	20,790	19,800	18,680	17,160
63 (17.2)		TC KW	22,530 1.71	21,820 1.88	20,970 2.05	19,820 2.23	18,260 2.45
	72 (22.2)	SHC	13,190	12,850	12,450	11,910	11,200
	76 (24.4)	SHC	15,090	14,750	14,340	13,810	13,100
	80 (26.7)	SHC	17,070	16,730	16,320	15,790	15,080
	84 (28.9)	SHC	18,970	18,630	18,220	17,690	16,980
	88 (31.1)	SHC	20,860	20,520	20,120	19,580	18,260
67 (19.4)		TC KW	23,140 1.73	22,770 1.89	* 22,000 2.07	20,790 2.26	19,360 2.50
	72 (22.2)	SHC	10,710	10,550	10,210	9,690	9,100
	76 (24.4)	SHC	12,610	12,440	12,110	11,590	10,990
	80 (26.7)	SHC	14,590	14,420	14,090	13,570	12,970
	84 (28.9)	SHC	16,480	16,320	15,980	15,470	14,870
	88 (31.1)	SHC	18,380	18,210	17,880	17,360	16,760
71 (21.7)		TC KW	23,870 1.75	23,470 1.91	22,880 2.10	21,950 2.32	20,570 2.56
	72 (22.2)	SHC	8,160	8,000	7,770	7,370	6,980
	76 (24.4)	SHC	10,060	9,900	9,670	9,260	8,780
	80 (26.7)	SHC	12,040	11,880	11,650	11,250	10,760
	84 (28.9)	SHC	13,930	13,780	13,540	13,140	12,660
	88 (31.1)	SHC	15,830	15,670	15,440	15,040	14,550
75 (23.9)		TC KW	24,330 1.78	24,070 1.95	23,540 2.13	22,700 2.37	21,780 2.62
	76 (24.4)	SHC	7,510	7,420	7,230	6,940	6,620
	80 (26.7)	SHC	9,490	9,400	9,210	8,920	8,600
	84 (28.9)	SHC	11,390	11,300	11,110	10,820	10,500
	88 (31.1)	SHC	13,290	13,190	13,000	12,710	12,390

TC:Total Cooling Capacity (BTU/H)

SHC:Sensible Heat Capacity (BTU/H)

KW:Compressor Input (KW)

Rating conditions(*MARK) are

:Outdoor Ambient Temp.95°F D.B.

:Indoor Unit Entering Air Temp.80°F D.B./67°F W.B.

COOLING CAPACITY

1PHASE 60Hz 208 V

MODEL NAME : 24KH12W

RATED CAPACITY : 21,600 BTU/H AIR FLOW RATE : 510 CFM							
EVAPORATOR		CONDENSER					
ENTERING TEMP °F(°C)		AMBIENT TEMP °F(°C)					
W.B	D.B		75(23.9)	85(29.4)	95(35)	105(40.6)	115(46.1)
59 (15.0)		TC KW	21,380 1.68	20,410 1.83	19,440 2.00	18,340 2.15	16,850 2.38
	72 (22.2)	SHC	15,200	14,680	14,180	13,620	12,880
	76 (24.4)	SHC	17,010	16,490	15,990	15,420	14,680
	80 (26.7)	SHC	18,890	18,380	17,870	17,310	16,570
	84 (28.9)	SHC	20,700	20,180	19,440	18,340	16,850
	88 (31.1)	SHC	21,380	20,410	19,440	18,340	16,850
63 (17.2)		TC KW	22,120 1.70	21,430 1.86	20,580 2.03	19,460 2.20	17,930 2.43
	72 (22.2)	SHC	12,900	12,560	12,160	11,630	10,920
	76 (24.4)	SHC	14,700	14,370	13,960	13,430	12,730
	80 (26.7)	SHC	16,590	16,260	15,850	15,320	14,620
	84 (28.9)	SHC	18,400	18,060	17,660	17,130	16,420
	88 (31.1)	SHC	20,200	19,870	19,460	18,930	17,930
67 (19.4)		TC KW	22,720 1.71	22,360 1.88	* 21,600 2.05	20,410 2.23	19,010 2.48
	72 (22.2)	SHC	10,510	10,350	10,020	9,510	8,910
	76 (24.4)	SHC	12,320	12,160	11,820	11,310	10,720
	80 (26.7)	SHC	14,210	14,040	13,710	13,200	12,610
	84 (28.9)	SHC	16,010	15,850	15,520	15,000	14,410
	88 (31.1)	SHC	17,820	17,660	17,320	16,810	16,220
71 (21.7)		TC KW	23,440 1.73	23,050 1.90	22,460 2.08	21,450 2.30	20,200 2.53
	72 (22.2)	SHC	8,070	7,910	7,680	7,280	6,800
	76 (24.4)	SHC	9,870	9,720	9,480	9,090	8,600
	80 (26.7)	SHC	11,760	11,600	11,370	10,970	10,490
	84 (28.9)	SHC	13,570	13,410	13,180	12,780	12,300
	88 (31.1)	SHC	15,370	15,220	14,980	14,590	14,100
75 (23.9)		TC KW	23,890 1.76	23,630 1.93	23,110 2.11	22,290 2.35	21,380 2.59
	76 (24.4)	SHC	7,430	7,330	7,150	6,860	6,540
	80 (26.7)	SHC	9,310	9,220	9,030	8,740	8,430
	84 (28.9)	SHC	11,120	11,030	10,840	10,550	10,230
	88 (31.1)	SHC	12,920	12,830	12,650	12,350	12,040

TC:Total Cooling Capacity (BTU/H)

SHC:Sensible Heat Capacity (BTU/H)

KW:Compressor Input (KW)

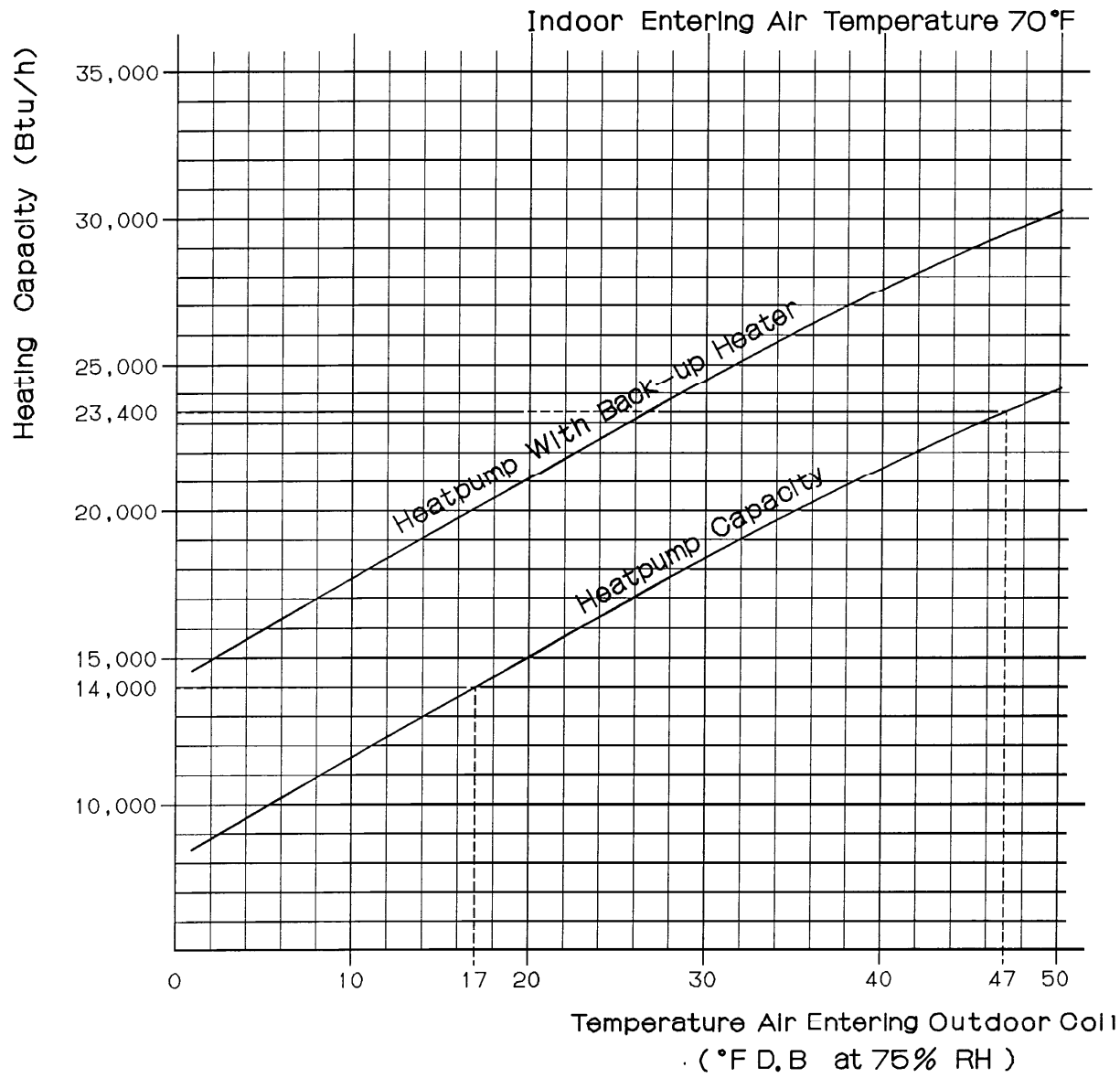
Rating conditions(*MARK) are

:Outdoor Ambient Temp.95°F D.B.

:Indoor Unit Entering Air Temp.80°F D.B./67°F W.B.

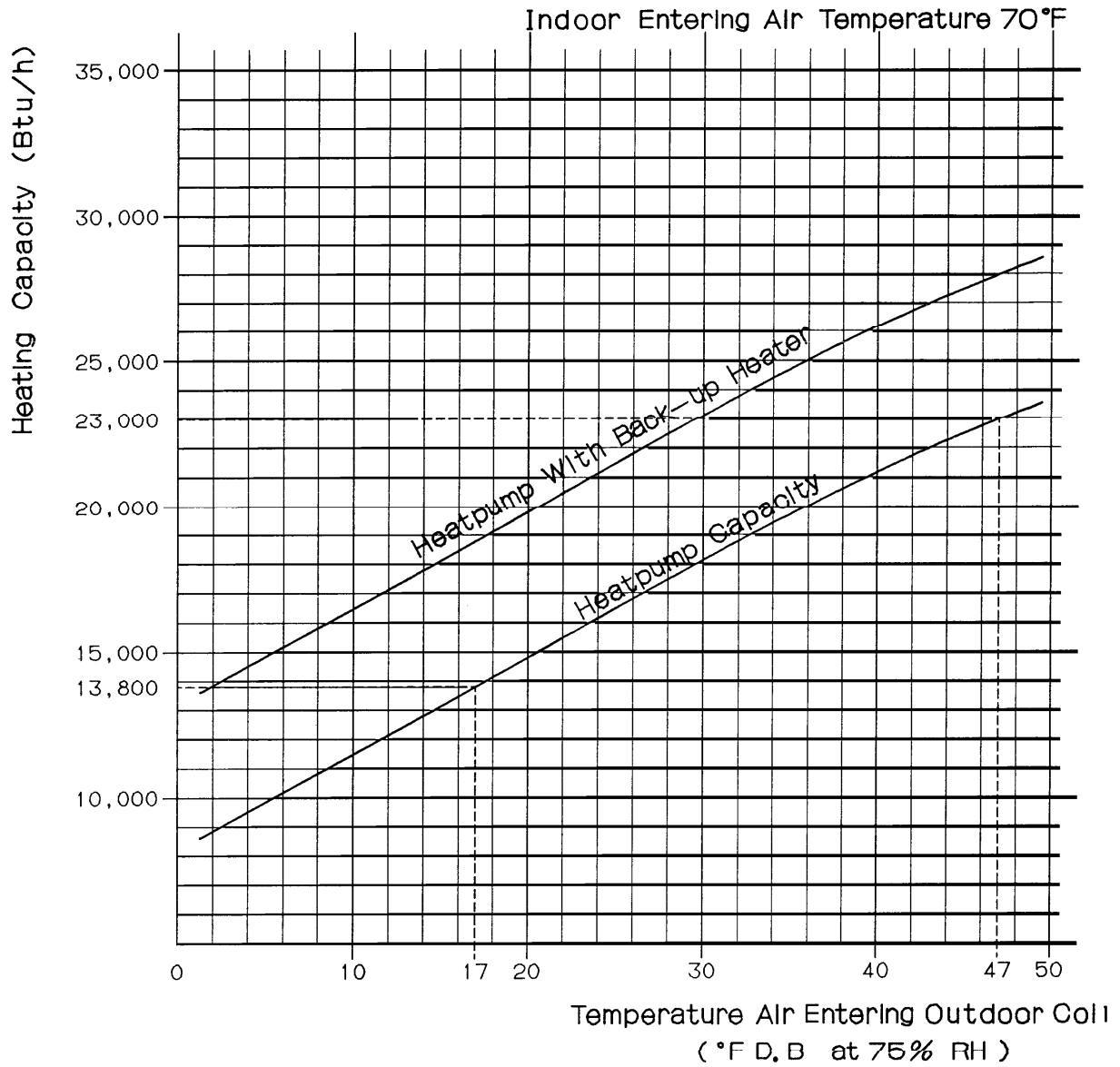
2) HEATING CAPACITY

1 Phase 60 Hz 230 V



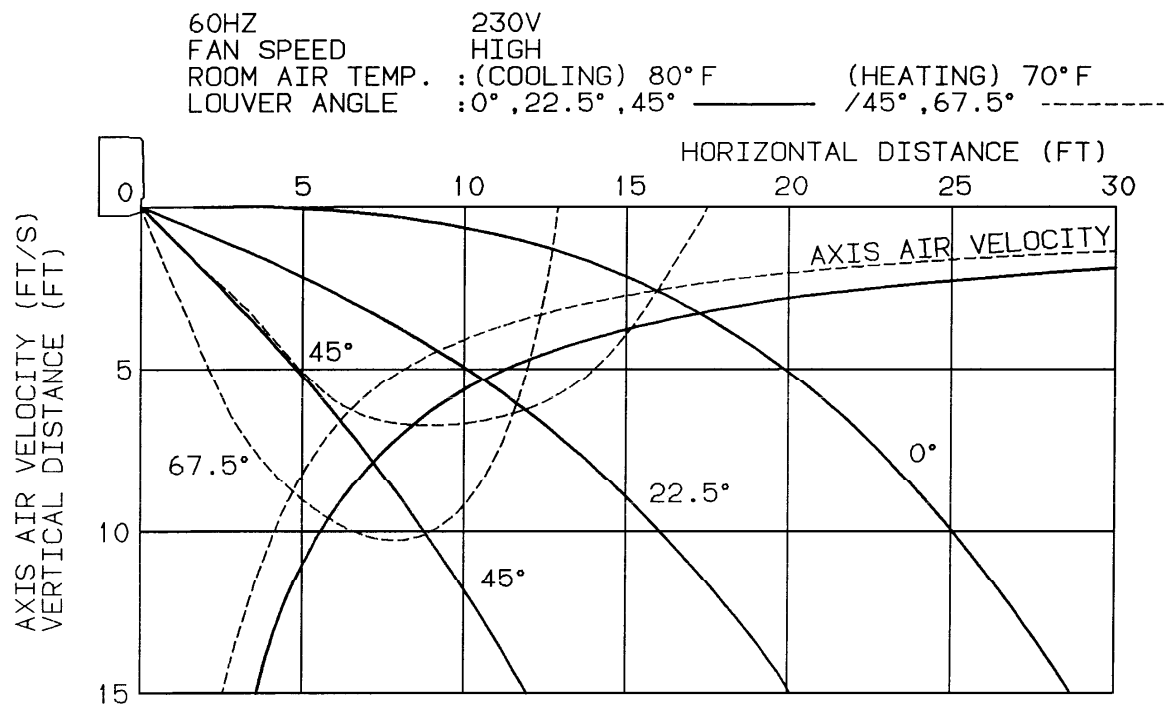
HEATING CAPACITY

1 Phase 60Hz 208V



6. AIR THROW DISTANCE CHART

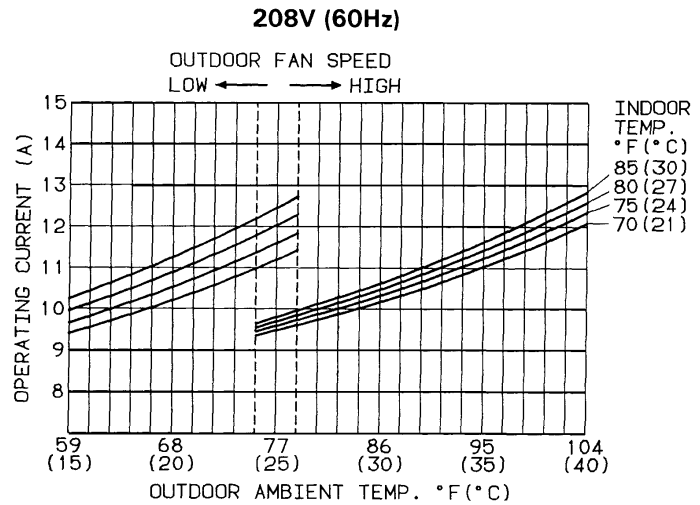
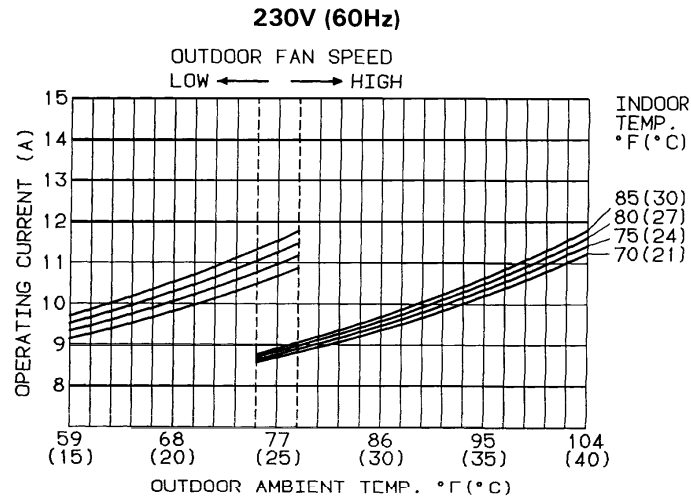
Indoor unit model : KH2412W



7. PERFORMANCE CHARTS

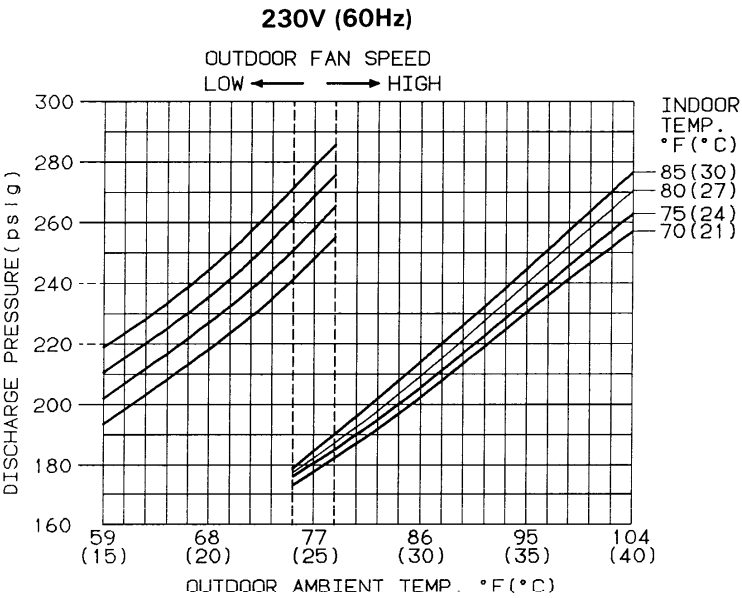
Cooling characteristics

Operating current characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High, overall value for indoor and outdoor shown.)



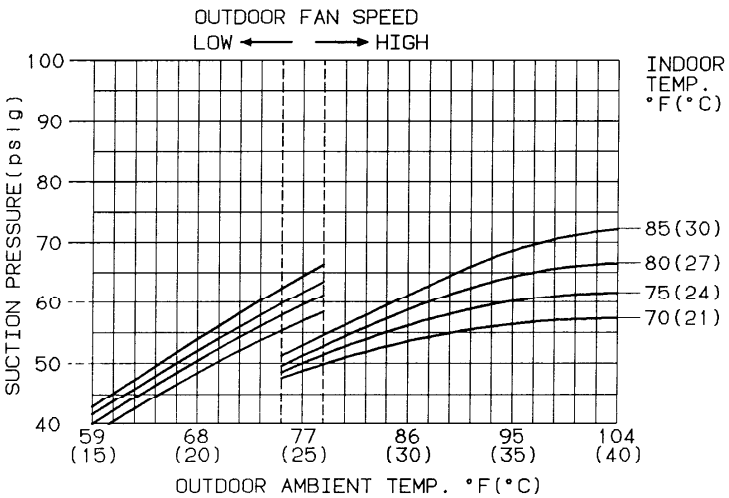
Cooling characteristics

High pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High.)



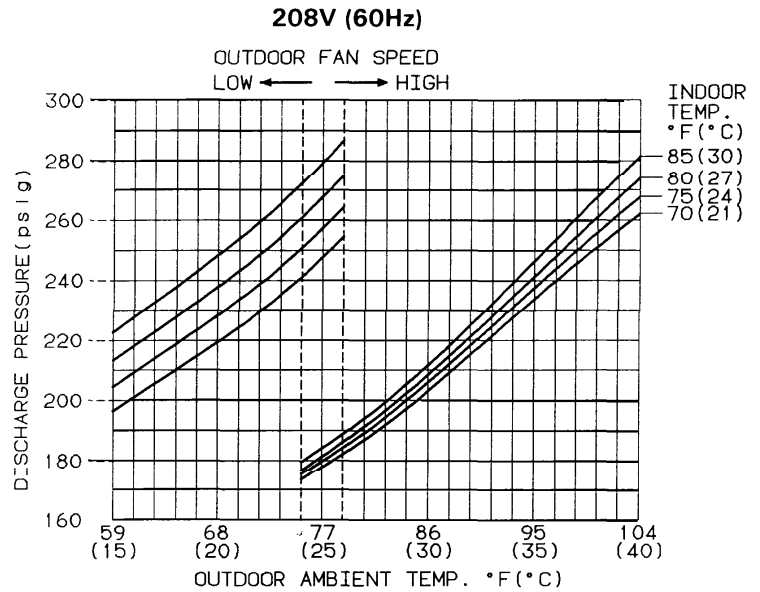
Cooling characteristics

Low pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High.)



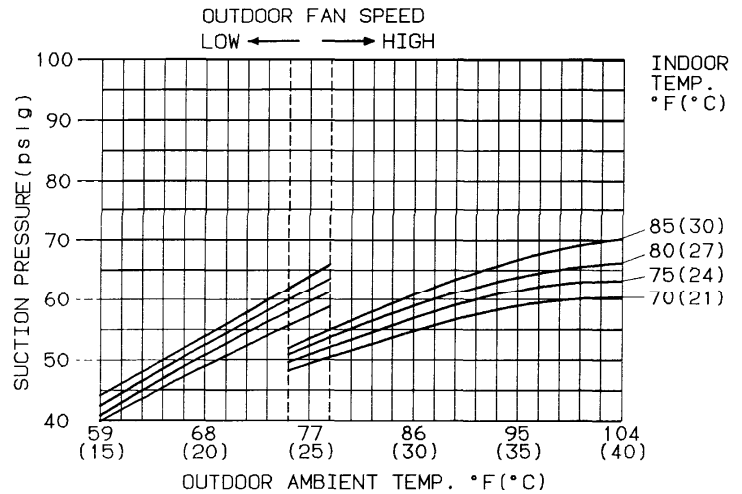
Cooling characteristics

High pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High.)



Cooling characteristics

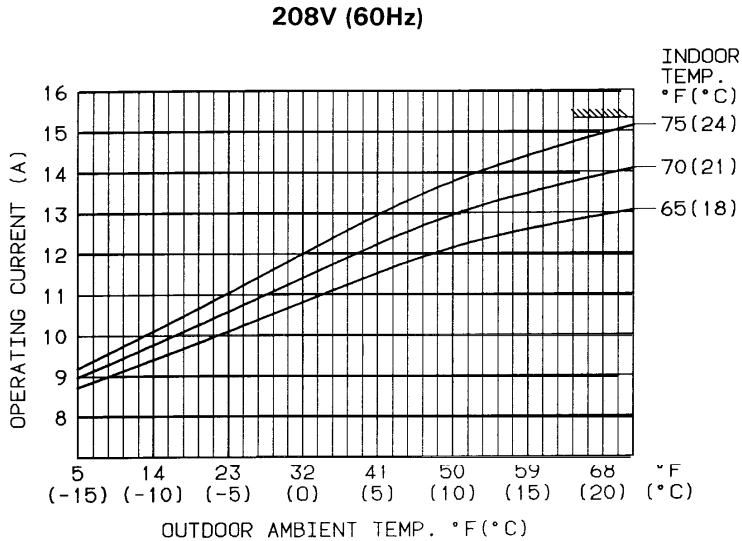
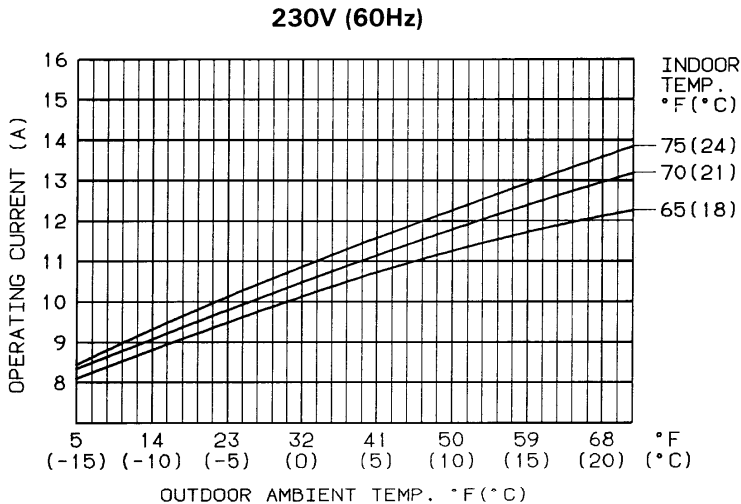
Low pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High.)



Heating characteritics

Operating current characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High, overall value for indoor and outdoor shown.) (However, the heater shall be excluded.)

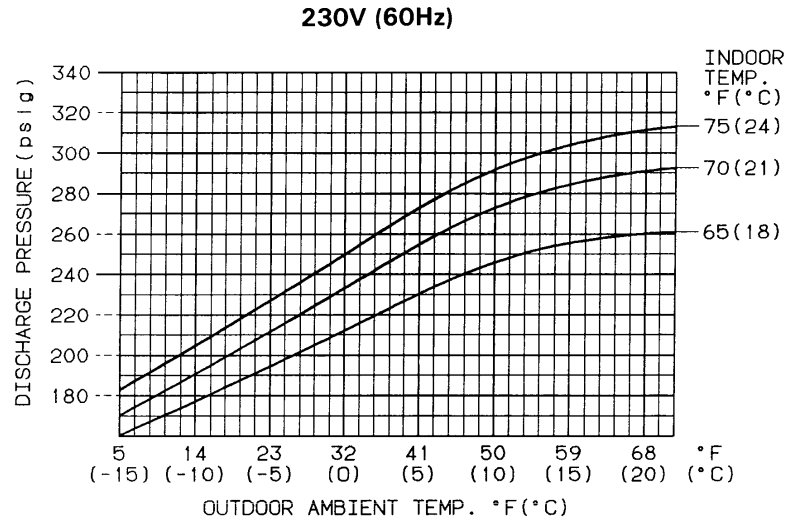
NOTE The by-pass opens when the high pressure level surpasses 327.12 pig (23 kg/cm²).



Heating characteristics

High pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High, overall value for indoor and outdoor shown.) (However, the heater shall be excluded.)

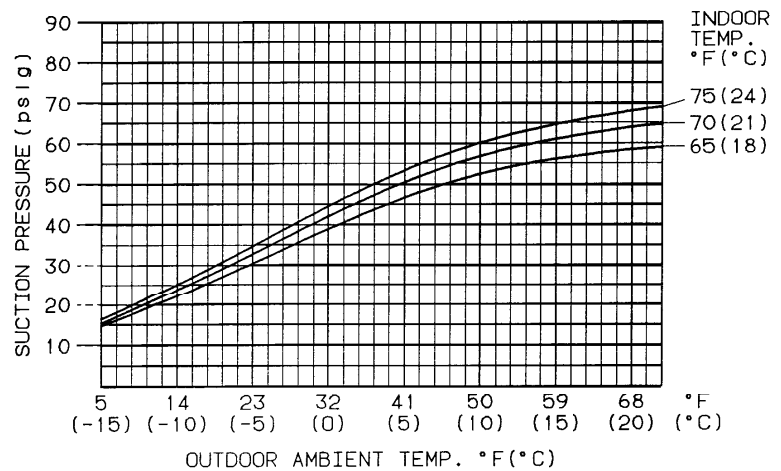
NOTE The by-pass opens when the high pressure level surpasses 327.12 psig (23 kg/cm²).



Heating characteristics

Low pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High.)

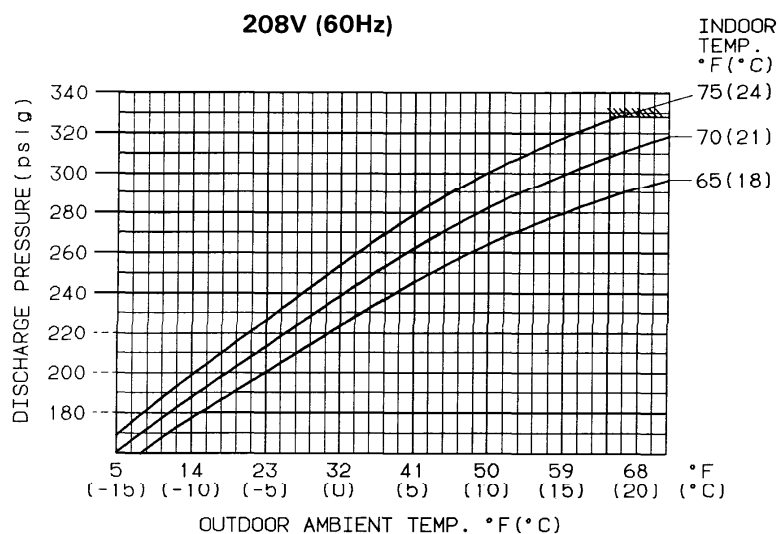
NOTE The by-pass opens when the high pressure level surpasses 327.12 psig (23 kg/cm²).



Heating characteristics

High pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High.)

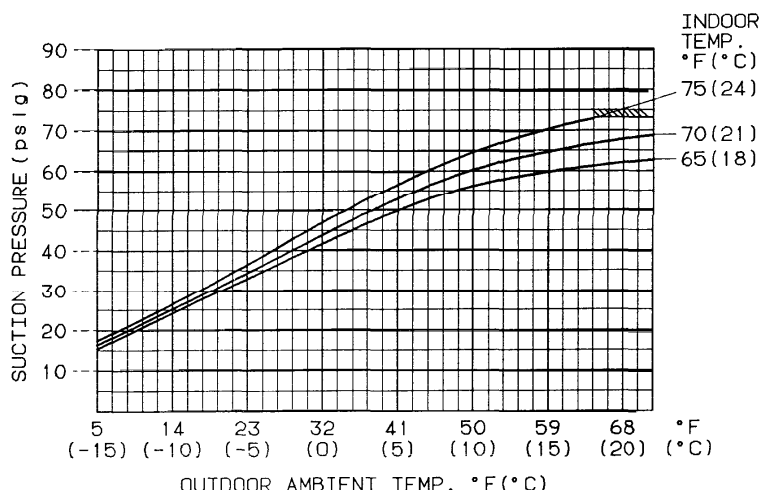
NOTE The by-pass opens when the high pressure level surpasses 327.12 psig (23 kg/cm²).



Heating characteristics

Low pressure characteristics versus outdoor ambient temperature and indoor temperature (Indoor relative humidity: 50%, indoor fan speed: High.)

NOTE The by-pass opens when the high pressure level surpasses 327.12 psig (23 kg/cm²).



8. OPERATING INSTRUCTIONS

Controls and Indicators

A. OPERATION BUTTON

This button is used to turn the heat pump ON/OFF.

B1. COOLING OPERATION LAMP

This lamp lights when the "COOL" mode is selected.

B2. HEATING OPERATION LAMP

This lamp lights when the "HEAT" mode is selected.

C. TIMER LAMP

This lamp lights when the system is operating on the timer.

D. SAVING MODE LAMP

This lamp lights when the NIGHT SETBACK or ENERGY SAVER mode is selected.

E. ROOM TEMPERATURE INDICATOR LAMPS

These lamps indicate the approximate room temperature at the location of the remote control unit.

F. TEMPERATURE SCALE

The numbers constitute the temperature scale (°F).

G. MODE SELECTOR

This has four options:

AUTO: When this setting is selected, the heat pump calculates the difference between the thermostat setting and the room temperature and automatically switches to the "cool" or "heat" mode as appropriate.

HEAT: Used for normal heating operation.

COOL: Used for normal cooling operation.

FAN: Choose this setting to run the fan only, without the heating or cooling function.

H. OPERATION SELECTOR

This has five options:

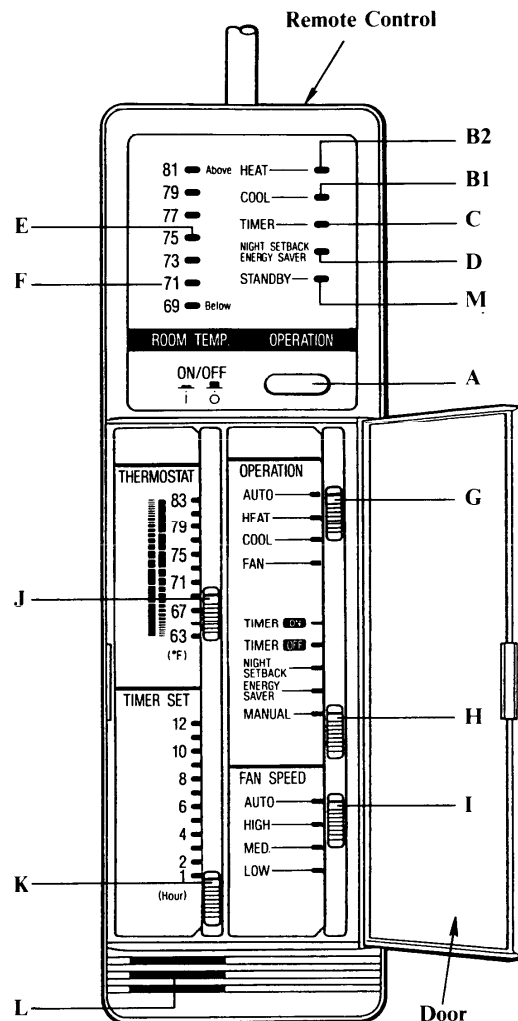
TIMER ON: Used to start the system at the set time.

TIMER OFF: Used to stop the system at the set time.

NIGHT SETBACK: Used for programmed energy saving operation at night.

ENERGY SAVER: Used for programmed energy saving operation during the day.

MANUAL: Used for conventional temperature control operation using the thermostat.



I. FAN SPEED SELECTOR

AUTO: In this mode the fan speed is set automatically.

HIGH
MED.: You can manually select the desired fan speed.
LOW

J. THERMOSTAT KNOB

You can regulate the room temperature as desired by adjusting this knob.

K. TIMER SET KNOB

This control is used to set the time at which you wish the heat pump to go on or off. Each number on the scale shows setting hour.

L. SENSOR

The sensor detects any change in the room temperature.




M. STANDBY LAMP

This lamp lights at the beginning of heating and when the system is in defrosting.

Operation Thumbnails

By setting this heat pump once to the desired temperature, it will automatically regulate the room temperature to that value. Thus you can operate the heat pump or stop it by simply pressing the OPERATION ON/OFF button.

First, open the door of the remote control unit to gain access to the control panel. Next, carry out the following steps while referring to the sub-section "Controls and Indicators" on the previous page.

What you wish to do	How to do it	What will happen
 <ul style="list-style-type: none"> Start the heat pump to get the desired room temperature very easily. 	 <ol style="list-style-type: none"> Set the "G" knob to AUTO. Set the "H" knob to MANUAL. Set the "I" knob to AUTO. Set the "J" knob to the desired temperature. Press the "A" OPERATION ON/OFF button. 	 <p>First, the "E" lamp will light to indicate the room temperature. If the room temperature is higher than the thermostat setting, the "B1" lamp will light and after a few minutes cooling will begin. If, on the other hand, the room temperature is lower than the thermostat setting, the "B2" lamp will light and heating will begin.</p>
<ul style="list-style-type: none"> To stop the heat pump immediately while it is operating 	<ol style="list-style-type: none"> Press the "A" OPERATION ON/OFF button. 	<p>The heat pump will stop immediately, and all indicator lamps will go out.</p>
<ul style="list-style-type: none"> To use the TIMER to stop the heat pump after several hours 	<ol style="list-style-type: none"> Set the "K" knob to the number of hours at which you wish to stop the heat pump. Set the "H" knob to the TIMER OFF position. 	<p>The "C" lamp will light and after the set hours have elapsed the heat pump will stop automatically.</p>
<ul style="list-style-type: none"> To switch the heat pump to the ENERGY SAVING mode during manual cooling (or heating) 	<p>Set the "H" knob from the MANUAL to the NIGHT SETBACK or ENERGY SAVER position.</p>	<p>The "D" lamp will light, the set temperature will automatically change, and the heat pump will continue to operate in the ENERGY SAVING mode.</p>
<ul style="list-style-type: none"> To use the TIMER to start the heat pump after several hours 	<ol style="list-style-type: none"> Set the "K" knob to the number of hours at which you wish to start the heat pump. Set the "H" knob to the TIMER ON position. Press the "A" OPERATION ON/OFF button. 	<p>The "C" lamp will light and after the set hours have elapsed the heat pump will start to operate automatically.</p>
<ul style="list-style-type: none"> To circulate the air in the room without air conditioning (fan-only operation) 	<ol style="list-style-type: none"> Set the "G" knob to FAN. Press the "A" OPERATION ON/OFF button. 	<p>The heat pump will operate as a circulation fan without changing the room temperature. In this case, only the "E" lamp will light.</p>

The above description is intended to provide you with basic knowledge of your heat pump. For details of each function, read the relevant sections.

Operation

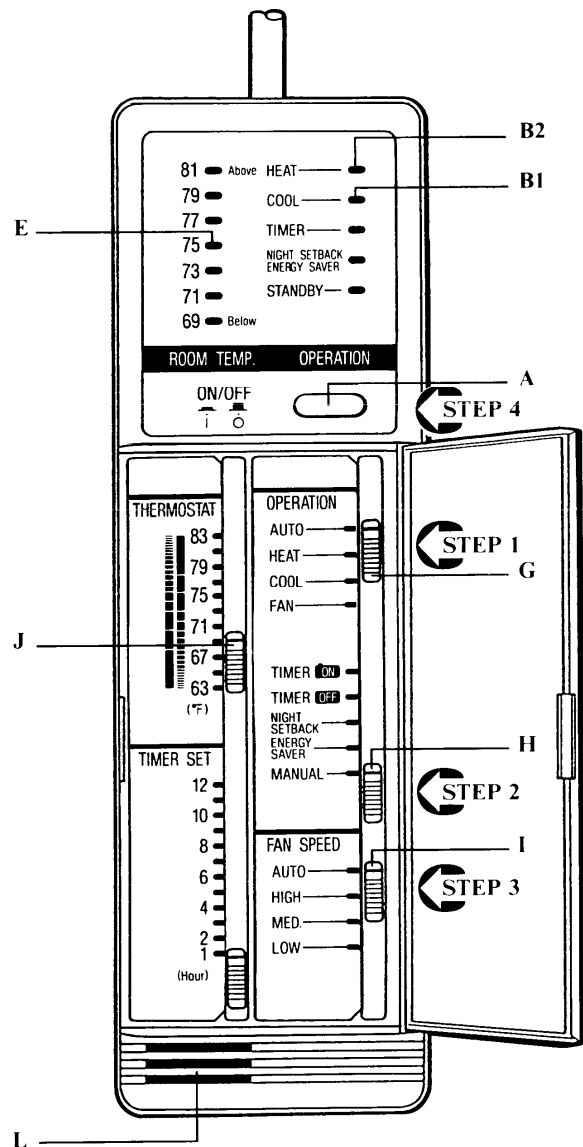
1) "Carefree" Operation

Once this mode is selected and the unit is preset by following the steps below, you can have the heat pump automatically bring the room to the desired temperature simply by pressing the OPERATION ON/OFF button.

- STEP 1:** Set the "G" MODE SELECTOR knob to AUTO.
- STEP 2:** Set the "H" OPERATION SELECTOR knob to MANUAL.
- STEP 3:** Set the "I" FAN SPEED at AUTO.
- STEP 4:** Press the "A" OPERATION ON/OFF button.
To stop the heat pump, press the OPERATION ON/OFF button again.

Sequence of Operation

Press the "A" OPERATION ON/OFF button. The "L" sensor registers the room temperature and the "E" lamp lights to indicate the current temperature. If the room temperature is higher than temperature you set using the "J" knob, the "B1" lamp will light and after a few minutes cooling will begin. If, on the other hand, the room temperature is lower, the "B2" lamp will light and heating will begin.



2) Cooling

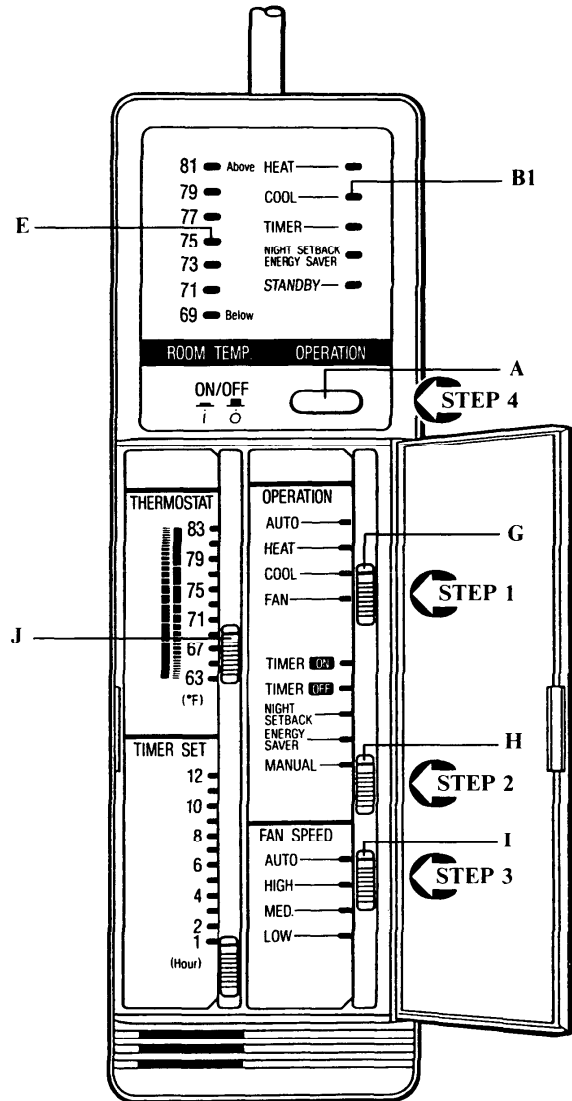
A. Manual Cooling

The Manual mode is used for normal cooling operation.

- STEP 1:** Set the "G" MODE SELECTOR knob to COOL.
- STEP 2:** Set the "H" OPERATION SELECTOR knob to MANUAL.
- STEP 3:** Set the "I" FAN SPEED as desired.
- STEP 4:** Press the "A" OPERATION ON/OFF button.
To stop the heat pump, press the OPERATION ON/OFF button again.

NOTE

1. This appliance has a built-in time delay circuit to ensure reliable operation. If the operation button is pressed, the compressor will start running after a few minutes.
 In the event of power failure, the unit will stop. When the power is applied, the unit will re-start automatically after 3 minutes.
2. To prevent the appliance from malfunctioning, do not set the selector knob between the two indicated positions. Make sure that it clicks into position.

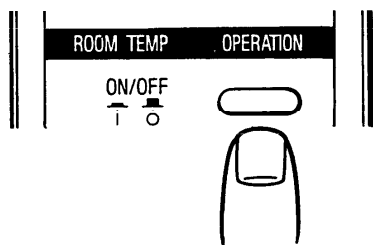


B. Energy Saving Modes

B1. Energy saver mode in cooling

STEP 1: Set the "H" OPERATION SELECTOR knob to ENERGY SAVER before turning the system on.

STEP 2: Press the "A" OPERATION ON/OFF button. The ENERGY SAVER and COOL lamps will light.

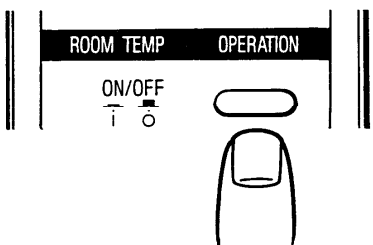


To cancel the Energy Saver mode, move the selector to MANUAL.

B2. Night Setback mode in cooling

STEP 1: Set the "H" OPERATION SELECTOR knob to NIGHT SETBACK before turning the system on.

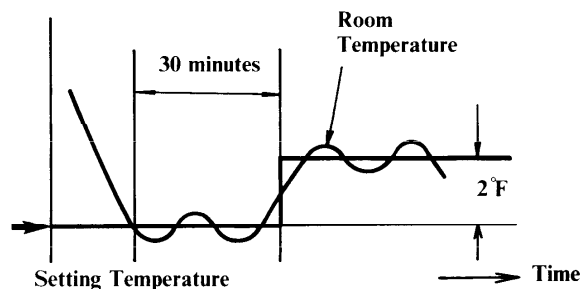
STEP2: Press the "A" OPERATION ON/OFF button. The NIGHT SETBACK and COOL lamp will light.



To cancel the Night Setback mode, move the selector to MANUAL.

■ What does the Energy Saver mode mean ?

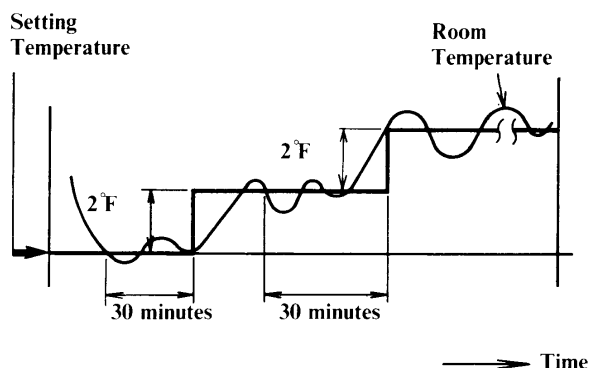
By selecting this mode then pressing the OPERATION ON/OFF button, the heat pump will perform cooling operation until the temperature in the room reaches the set value, then the thermostat will cause the unit to pause. After about 30 minutes, the heat pump will automatically raise the set temperature 2°F as shown in the diagram below. This enables you to save energy without sacrificing comfort. This function is convenient for when the room is vacant or soft cooling is needed in the daytime.



■ What does the Night Setback mode mean ?

By selecting this mode then pressing the OPERATION ON/OFF button, the heat pump will perform cooling operation until the temperature in the room reaches the set value, then the thermostat will cause the unit to pause.

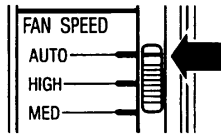
After about 30 minutes, the heat pump will automatically raise the set temperature 2°F. When the room temperature reaches the newly set value, the thermostat will cause the unit to pause. After about 30 minutes the temperature is again raised by 2°F as shown below. This enables you to save energy. This function is convenient for when leaving the heat pump on all night or soft cooling is needed.



3) Adjusting the Fan Speed

A. Automatic

Simply set the "I" FAN SPEED selector to the "AUTO" position.



A microcomputer in the heat pump automatically controls the fan speed when the AUTO mode is selected. When the heat pump starts operating, the difference between the room temperature and the set temperature is detected by the microcomputer which then automatically switches the fan speed to the most suitable level.

Cooling mode:

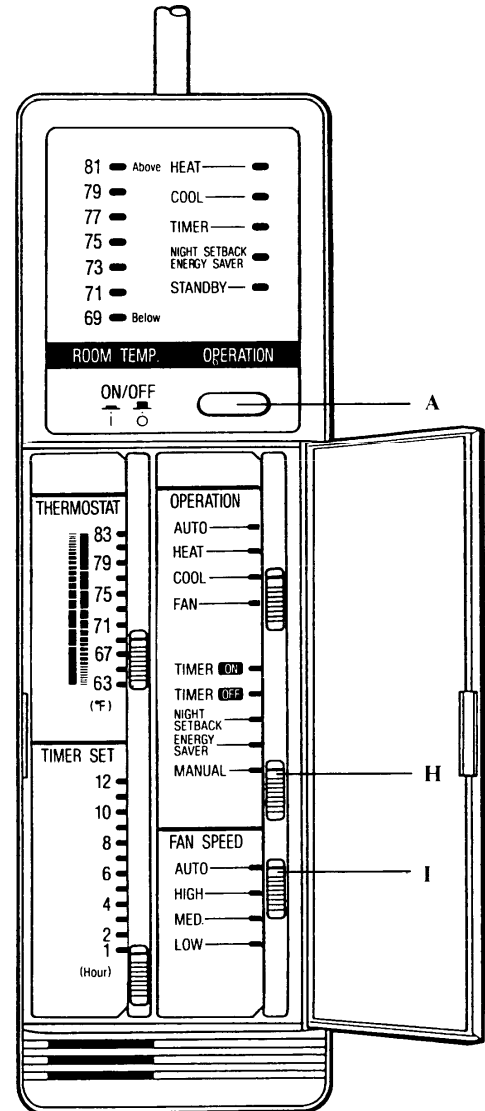
When difference between room temperature and set temperature is	FAN SPEED
Above 4°F	High
Between 4°F and 2°F	Medium
Below 2°F	Low

Heating mode:

When difference between room temperature and set temperature is	FAN SPEED
2°F and over	High
Below 2°F	Medium

B. Manual

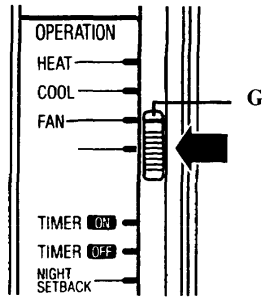
If you want to adjust fan speed manually during cooling, just set the FAN SPEED selector as desired. [HIGH, MED., or LOW]



4) Fan Only

If you want to circulate air without any temperature control, follow these steps:

STEP: 1 Set the "G" MODE SELECTOR knob to FAN.



STEP: 2 Press the "A" OPERATION ON/OFF button.

5) Using the Timer

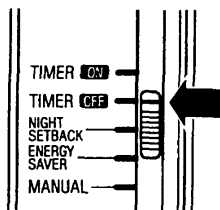
A. TIMER OFF Mode

The system stops after the set hours have elapsed.

STEP 1: Set the TIMER SET knob to the desired number of hours.

When the timer is set to 8, for instance, the system stops after eight hours.

STEP 2: Set the "H" OPERATION SELECTOR knob to TIMER OFF.



STEP 3: Press the "A" OPERATION ON/OFF button. The TIMER lamp will light.

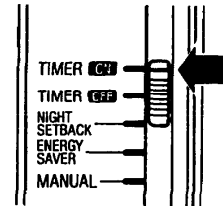
B. TIMER ON Mode

The system starts at the set time.

STEP 1: Set the TIMER SET knob to the desired time.

When the timer is set to 8, for instance, the system starts after eight hours.

STEP 2: Set the "H" OPERATION SELECTOR knob to TIMER ON.



STEP 3: Press the "A" OPERATION ON/OFF button. The TIMER lamp will light.

NOTE

If you set the SELECTOR to the TIMER ON position while the heat pump is operating in the NIGHT SET BACK, ENERGY SAVER or MANUAL mode, the heat pump will stop, then after several minutes it will re-start automatically.

Power failure during timer operation

If power failure occurs, the time counted up to that point will become void. After the power is applied, the timer newly starts counting at the set time.

6) Heating

A. Manual Heating

The Manual mode is used for normal heating operation.

- STEP 1:** Set the "G" MODE SELECTOR knob to HEAT.
- STEP 2:** Set the "H" OPERATION SELECTOR knob to MANUAL.
- STEP 3:** Set the "I" FAN SPEED as desired.
- STEP 4:** Press the "A" OPERATION ON/OFF button.
To stop the heat pump, press the OPERATION ON/OFF button again.

NOTE

1. This appliance has a built-in time delay circuit to ensure reliable operation. If the operation button is pressed, the compressor will start running after a few minutes.
In the event of power failure, the unit will stop. When the power is applied, the unit will re-start automatically after 3 minutes.
2. To prevent the appliance from malfunctioning, do not set the selector knob between the two indicated positions. Make sure that it clicks into position.
3. In order to protect the appliance from an overload, the fan sometimes continues to rotate for about 30 seconds after the OPERATION ON/OFF button is pressed OFF.

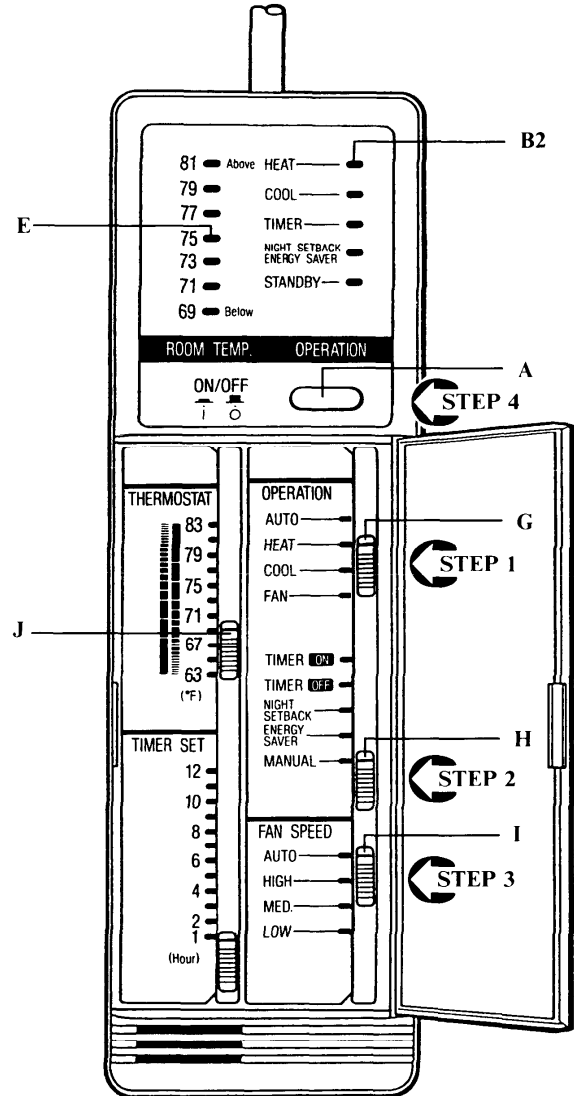
Special remarks on heating

Heating performance

- Because this heat pump heats a room by drawing in the heat of the outside air (heat pump system), the heating efficiency will fall off when the outdoor temperature is very low. If sufficient heat cannot be obtained with this heat pump, use another heating appliance in conjunction with it.

Defrosting

- When the outdoor temperature is low, frost or ice may form on the heat exchanger coil, reducing the heating performance. When this happens, a micro-computer defrosting system operates. At the same time, the fan on the indoor unit stops and the STANDBY LAMP remains lit until defrosting is completed. Heating operation restarts after several minutes. (This interval will vary slightly depending upon the outdoor temperature and the way in which frost forms).



STANDBY LAMP

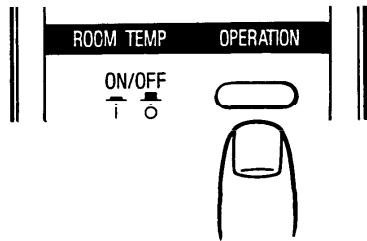
- For several minutes after the start of heating operation, the indoor fan will not start running until the indoor heat exchanger coil has warmed up sufficiently. This is because the COLD DRAFT PREVENTION SYSTEM is operating. During this period, the STANDBY LAMP remains lit.
- The STANDBY lamp also remains lit during defrosting or when the compressor has been turned off by the thermostat when the system is in the heating mode.
- Upon completion of defrosting and when the compressor is turned on again, for heating operation, the STANDBY LAMP will go off automatically.

B. Energy Saving Modes

B1. Energy saver mode in heating

STEP 1: Set the "H" OPERATION SELECTOR knob to ENERGY SAVER before turning the system on.

STEP 2: Press the "A" OPERATION ON/OFF button. The ENERGY SAVER and HEAT lamps will light.

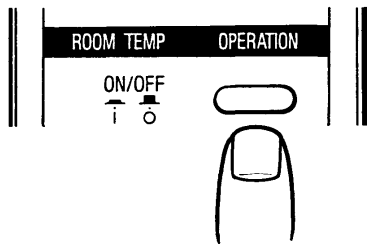


To cancel the Energy Saver mode, move the selector to MANUAL.

B2. Night Setback mode in heating

STEP 1: Set the "H" OPERATION SELECTOR knob to NIGHT SETBACK before turning the system on.

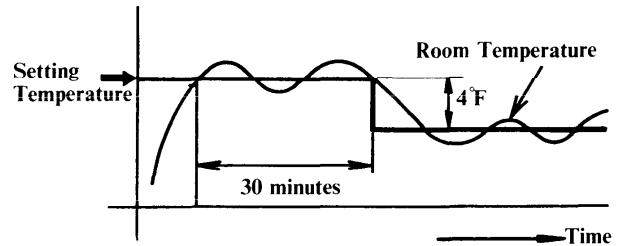
STEP 2: Press the "A" OPERATION ON/OFF button. The NIGHT SETBACK and HEAT lamps will light.



To cancel the Night Setback mode, move the selector to MANUAL.

■ What does the Energy Saver mode mean ?

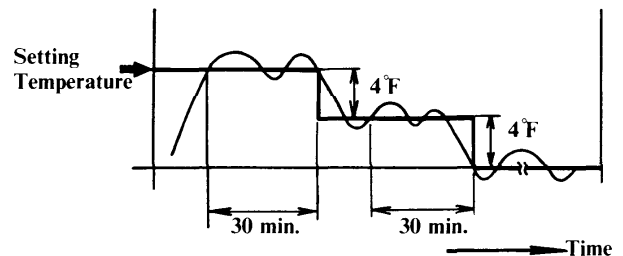
By selecting this mode then pressing the OPERATION ON/OFF button, the heat pump will perform heating operation until the temperature in the room reaches the set value, then the thermostat will cause the unit to pause. After about half an hour, the heat pump will automatically lower the set temperature 4°F as shown in the diagram below. This enables you to save energy without sacrificing comfort. This function is convenient for when the room is vacant or mild heating is needed in the daytime.



■ What does the Night Setback mode mean ?

By selecting this mode then pressing the OPERATION ON/OFF button, the heat pump will perform heating operation until the temperature in the room reaches the set value, then the thermostat will cause the unit to pause.

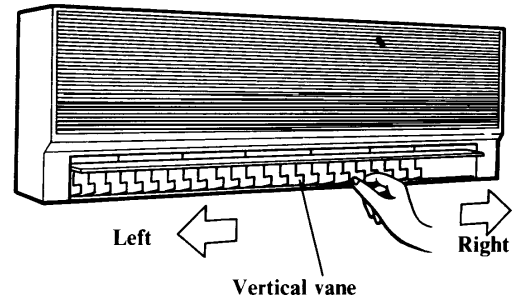
After about 30 minutes, the heat pump will automatically lower the set temperature 4°F. When the room temperature reaches the newly set value, the thermostat will cause the unit to pause. After about 30 minutes, the temperature is again lowered by 4°F as shown below. This enables you to save energy. This function is convenient for when leaving the heat pump on all night or mild heating is needed.



7) Adjusting the Air Flow Direction

A. Horizontal

The horizontal air flow can be adjusted by moving the vertical vane to the left or right.



B. Vertical

Hold both ends of the flap and move the flap up and down to adjust the vertical air flow.

Recommended flap positions:

COOLING

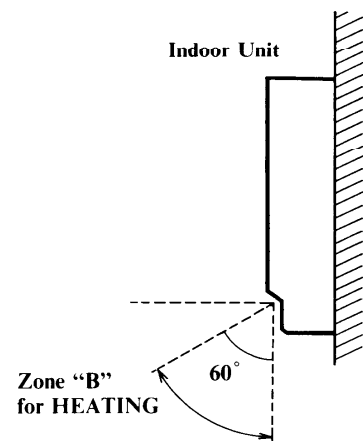
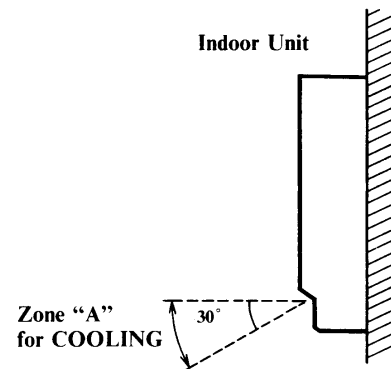
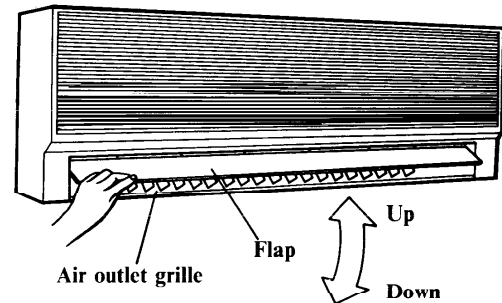
- Be sure to set the flap within zone “A”.

NOTE

- If the flap is set within zone “B”, condensation may form near the air outlet grille and drip onto the floor.

HEATING

- Set the flap within zone “B” for effective heating.



Care and Cleaning



For safety's sake, be sure to turn the heat pump off and also disconnect it from the power mains before cleaning it.

Casing and Grille (Indoor Unit)

Clean the casing and grille of the indoor unit with a vacuum cleaner brush, or wipe them with a clean soft cloth.

If these parts are stained, use a clean cloth moistened with a mild liquid detergent.

When cleaning the grille, be careful so as not to force the vanes out of place.

CAUTION

1. Do not pour water on the unit to clean it. This will damage the internal components and cause an electric shock hazard.
2. Never use solvents, or harsh chemicals. Do not wipe the plastic casing using very hot water.

Outdoor Unit

CAUTION

1. Certain metal edges and the condenser fins are sharp and may cause injury if handled improperly; special care should be taken when you clean these parts.
2. Periodically check the outdoor unit to see if the air outlet or air intake are clogged with dirt or soot.
3. The internal coil and other components of the outdoor unit must also be cleaned periodically. Consult your dealer or service shop.

TEST RUN

Service TEST RUN switch (recessed)

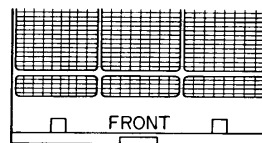
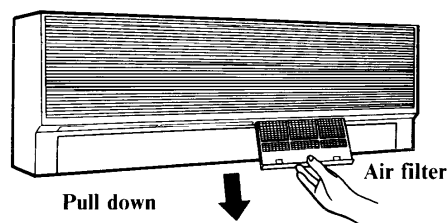
The Service TEST RUN switch is located at the rear bottom of the remote control unit. It is used for servicing the heat pump. Do not touch it, therefore. *During normal operation, this switch must be set in the RUN position.* If the heat pump is used with the switch in the TEST RUN position, it will not operate normally.

Air Filter

The air filter behind the air intake grille should be checked and cleaned at least once every two weeks.

How to remove the filter

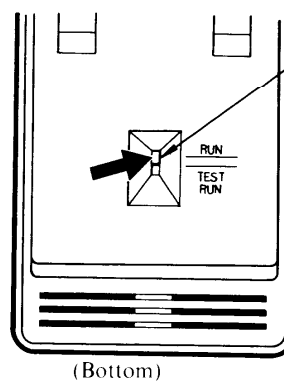
1. Place the flap on the air outlet grille in the bottom-most position.
2. Grasp the air filter by the tab at the bottom, and pull downward.



Use a vacuum cleaner to remove light dust. If there is sticky dust on the filter, wash the filter in lukewarm, soapy water, rinse it in clean water, and dry it.

When replacing the filter, check that the FRONT mark is facing you.

Service TEST RUN switch



Remote control unit viewed from the rear

9. FUNCTION

1) Temperature Control

■ Cooling

- Temperature control is obtained by cycling the compressor ON and OFF under control of the room temperature sensor in the remote control unit.
- The compressor turn to OFF below the setting temperature (Thermo OFF), and turn to ON above 1°F from setting temperature (Thermo ON).

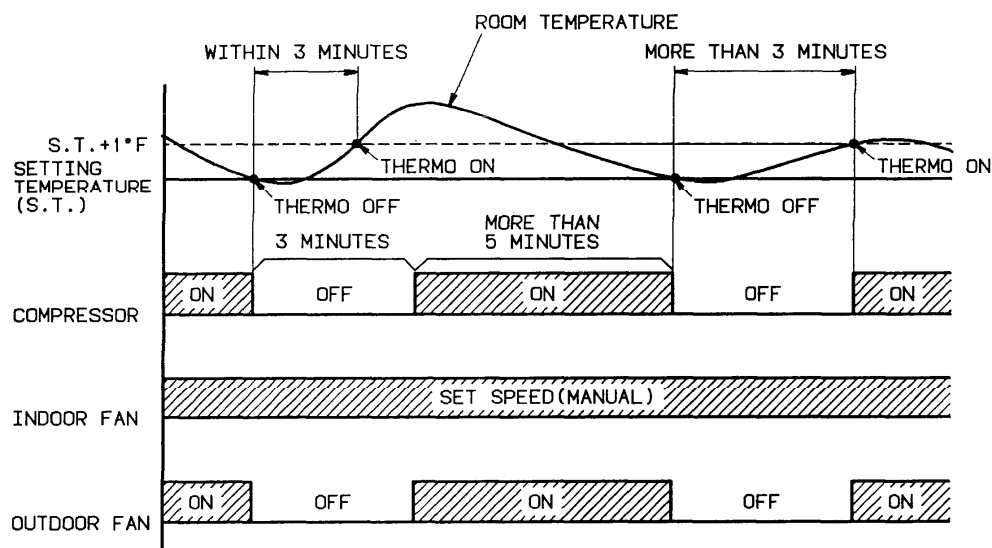


Fig. 1

- In order to keep the compressor from stalling out when trying to start against the high side refrigerant pressure, the control circuit has a built-in automatic time delay to allow the internal pressure to equalize. The control circuit will not try to start the compressor until it has been off for three (3) minutes.
- The compressor keep to turn forced for five (5) minutes, but the operation button is set to OFF, the compressor stop to turn.
- The compressor is not controlled by thermostat while the compressor run within five (5) minutes, or stop to run within three (3) minutes.

■ Heating

- Temperature control is obtained by cycling the compressor ON and OFF under control of the room temperature sensor in the remote control unit.
- The compressor turn to OFF above the setting temperature (Thermo OFF), and turn to ON below 1°F from the setting temperature (Thermo ON).

The compressor start to run at Thermo ON and heating operation start, then if the room temperature is down below 3.6°F from the setting temperature, the electric heater will be ON. (When the operation button is set to ON to start heating operation, the electric heater will be ON following the compressor operation.)

- The electric heater is OFF when the operation is Thermo OFF and the compressor stop to run.

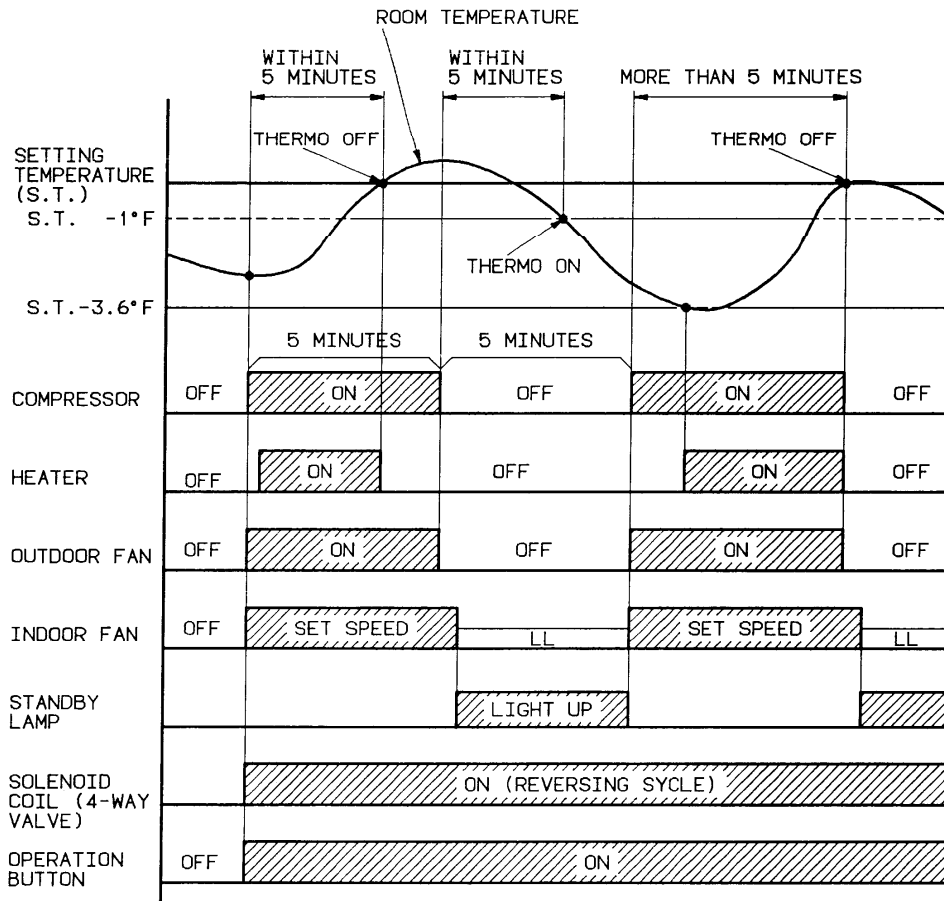


Fig. 2

- In order to keep the compressor from stalling out when trying to start against the high side refrigerant pressure, the control circuit has a built-in automatic time delay to allow the internal pressure to equalize. The control circuit will not try to start the compressor until it has been off for five (5) minutes.
- The compressor keep to turn forced for five (5) minutes, but the operation button is set to OFF, the compressor stop to turn.
- The compressor is not controlled by thermostat while the compressor run within five (5) minutes or stop to run.

2) Energy Saver Modes Timing Chart

■ Cooling

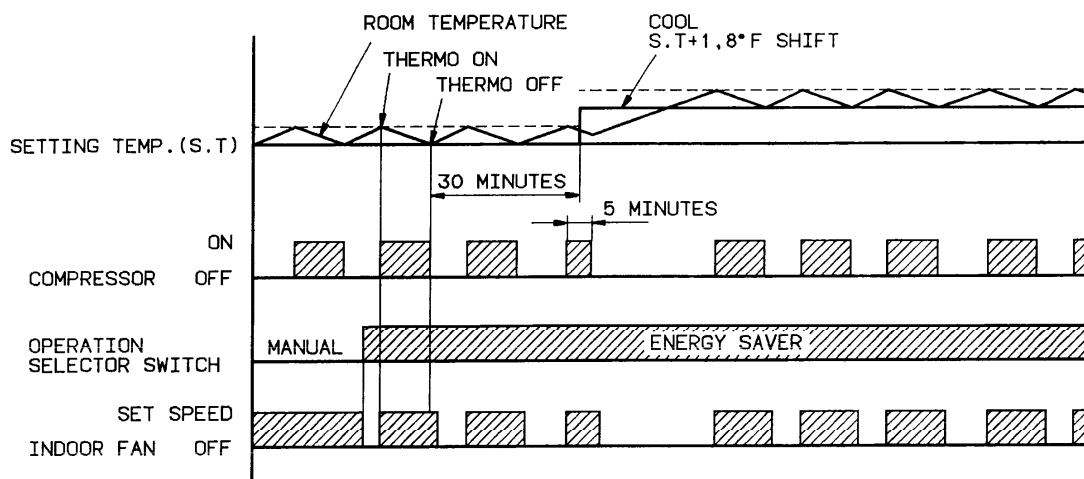


Fig. 3

■ Heating

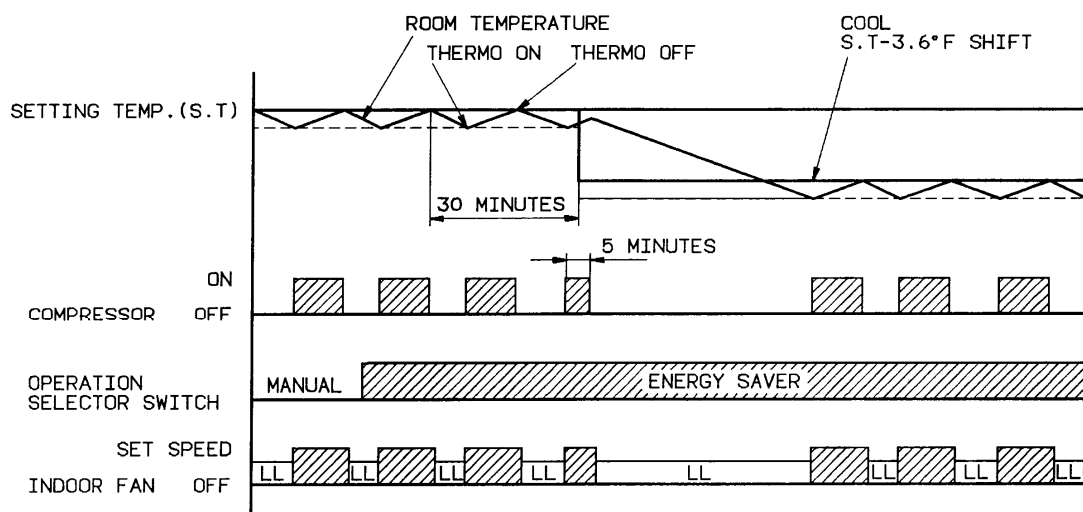


Fig. 4

3) Night Setback Modes Timing Chart

■ Cooling

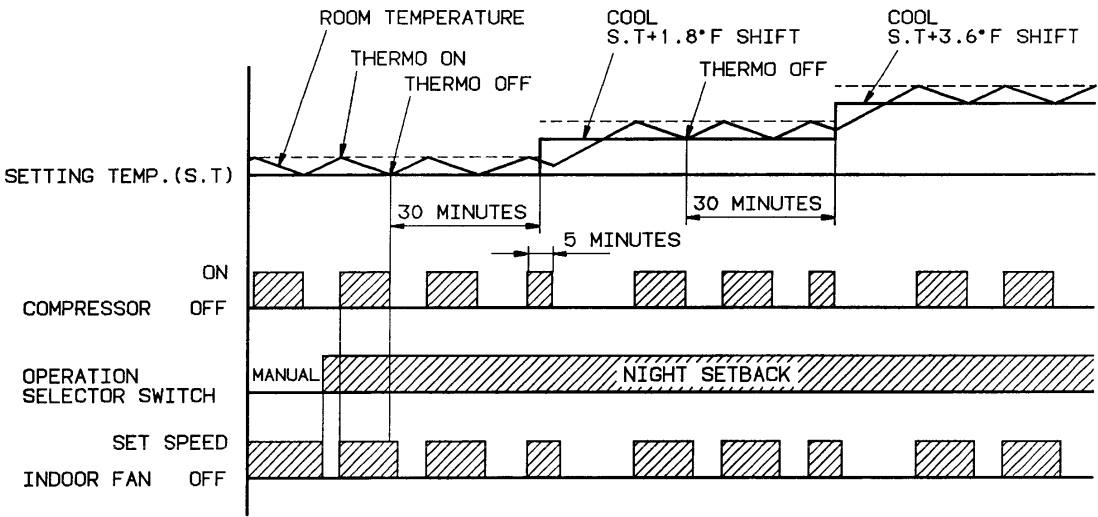


Fig. 5

■ Heating

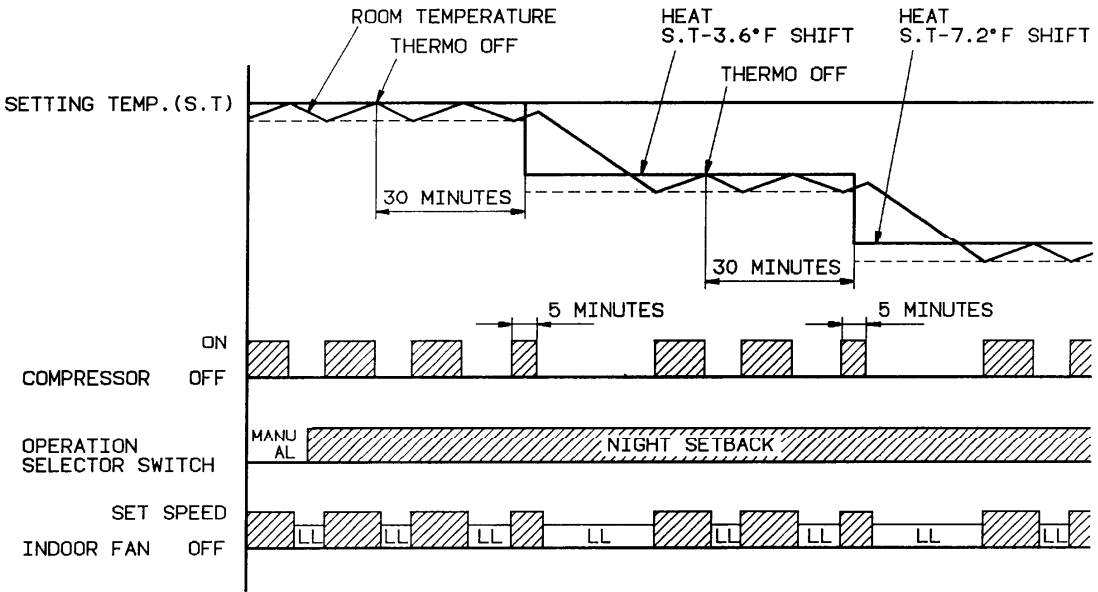


Fig. 6

4) Auto Modes

■ Manual mode

- Timing chart

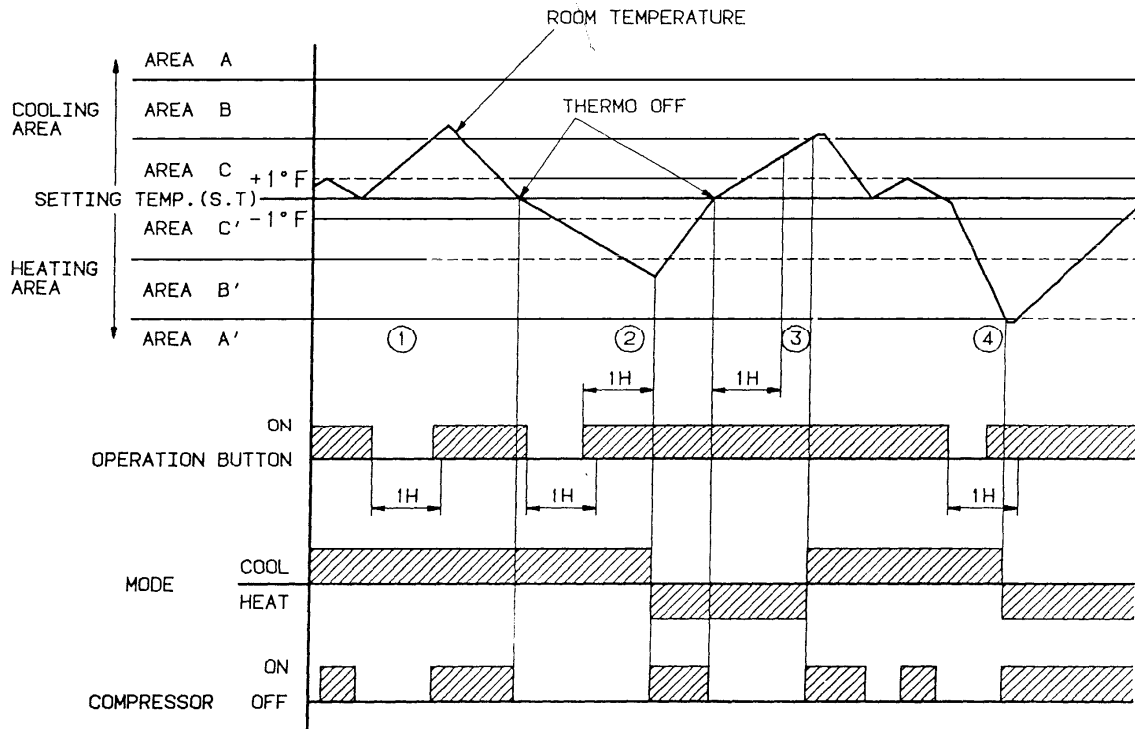


Fig. 7

- The MODE (Cool or Heat) is selected automatically by setting temperature and room temperature.
- In case of room temperature changes in the AREA C and C', the MODE will not change.
- When the room temperature changes from the COOLING AREA to the AREA B' of the HEATING AREA (from the HEATING AREA to the AREA B of the COOLING AREA), the MODE will change by timer. Refer to ① → ②, ② → ③
- When the room temperature changes from the COOLING AREA to the AREA A' of the HEATING AREA (from the HEATING AREA to the AREA A of the COOLING AREA), the MODE will change soon. Refer to ③ → ④

■ Energy Saver mode timing chart

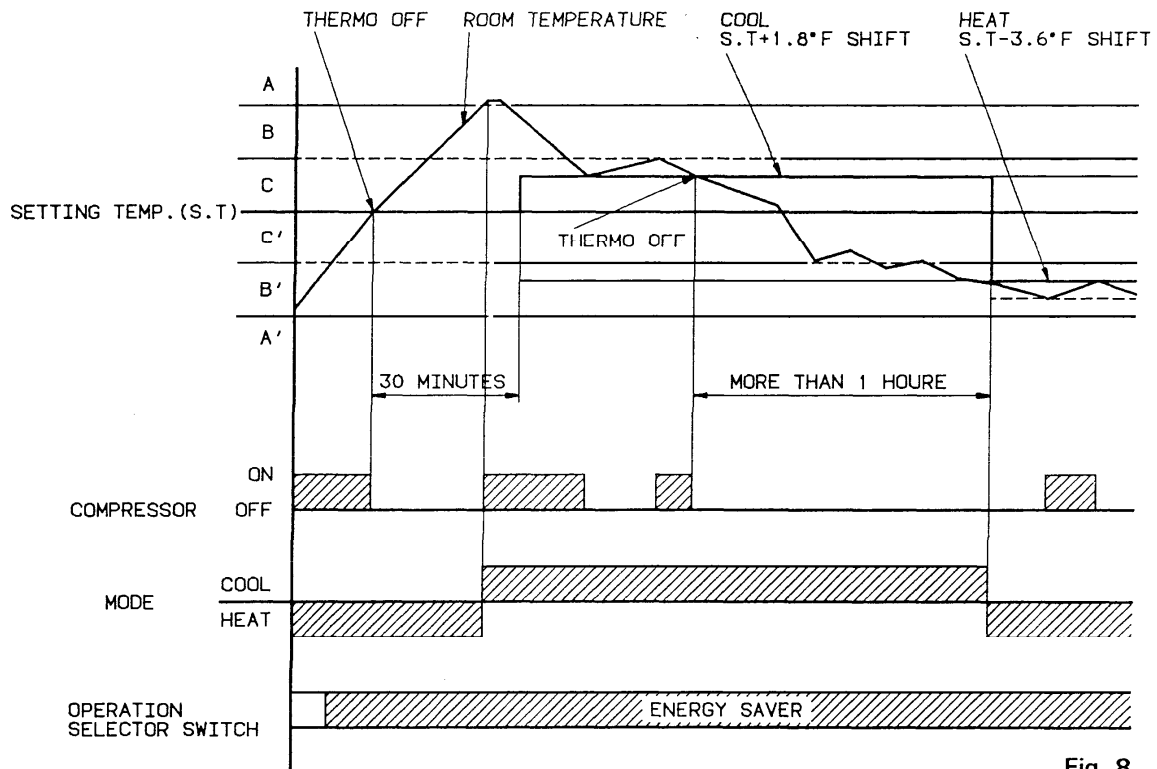


Fig. 8

■ Night Setback mode timing chart

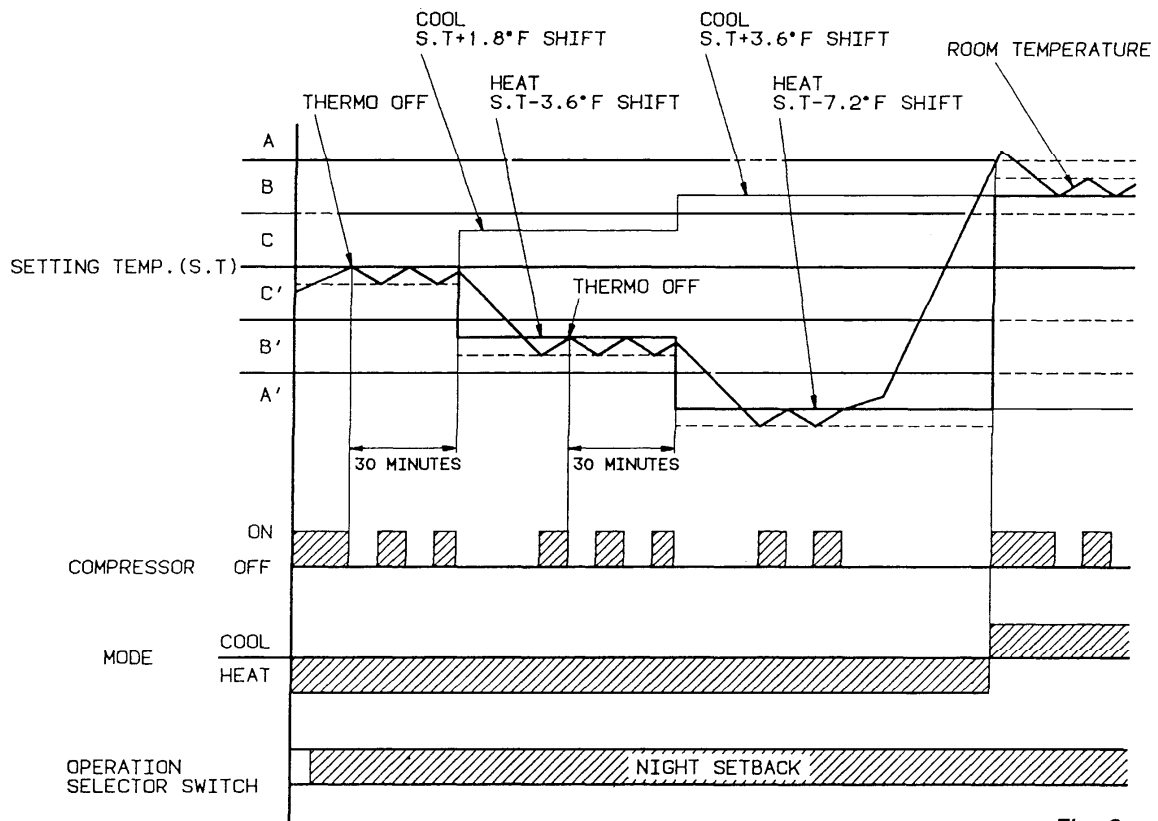


Fig. 9

5) Freeze Prevention (Cooling)

- If the indoor coil temperature falls below 23°F when the compressor has been turning for 10 minutes or more, the controller signals to stop turning to the compressor and outdoor fan.
- The compressor and outdoor fan motor will start to turn after 6 minutes.

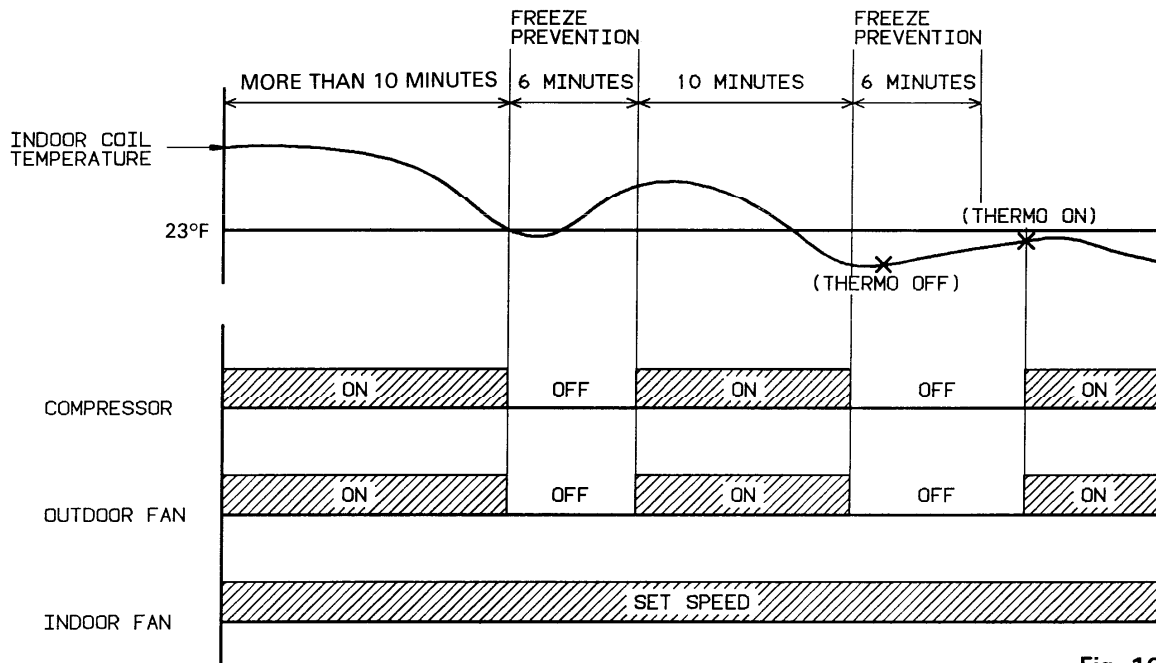


Fig. 10

6) Outdoor Fan Speed Control

■ Cooling

- In low temperature areas, the outdoor fan is set automatically to LOW to prevent freezing.
- When the outdoor air temperature falls below 75°F, the outdoor fan is set to LOW.
- When the outdoor air temperature rises to 79°F, the outdoor fan is set to HIGH.

7) Overload Prevention (Heating)

When the indoor coil temperature rises above 135°F, if the set speed of the indoor fan is LOW, the fan speed changes to MED., and when the temperature falls below 117°F, the fan speed return to LOW.

Thus the system is protected from the overload.

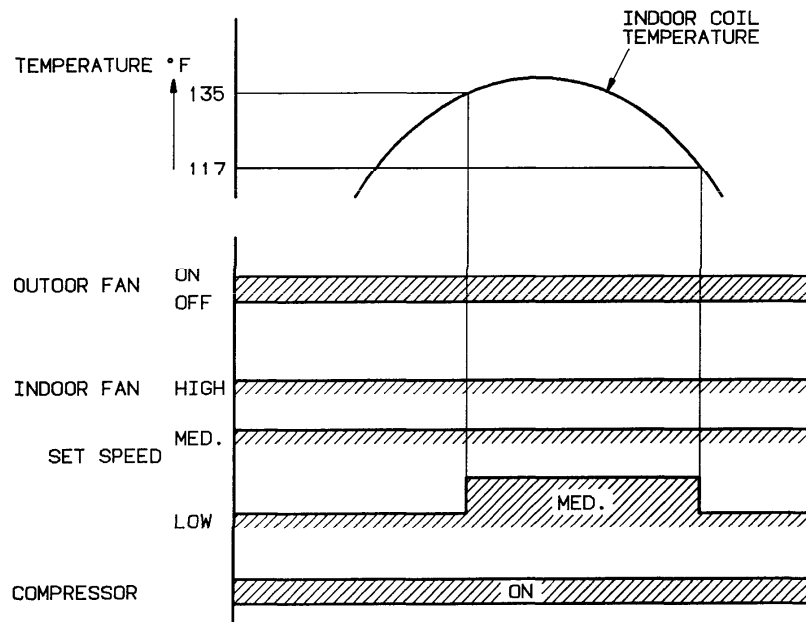
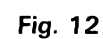


Fig. 11

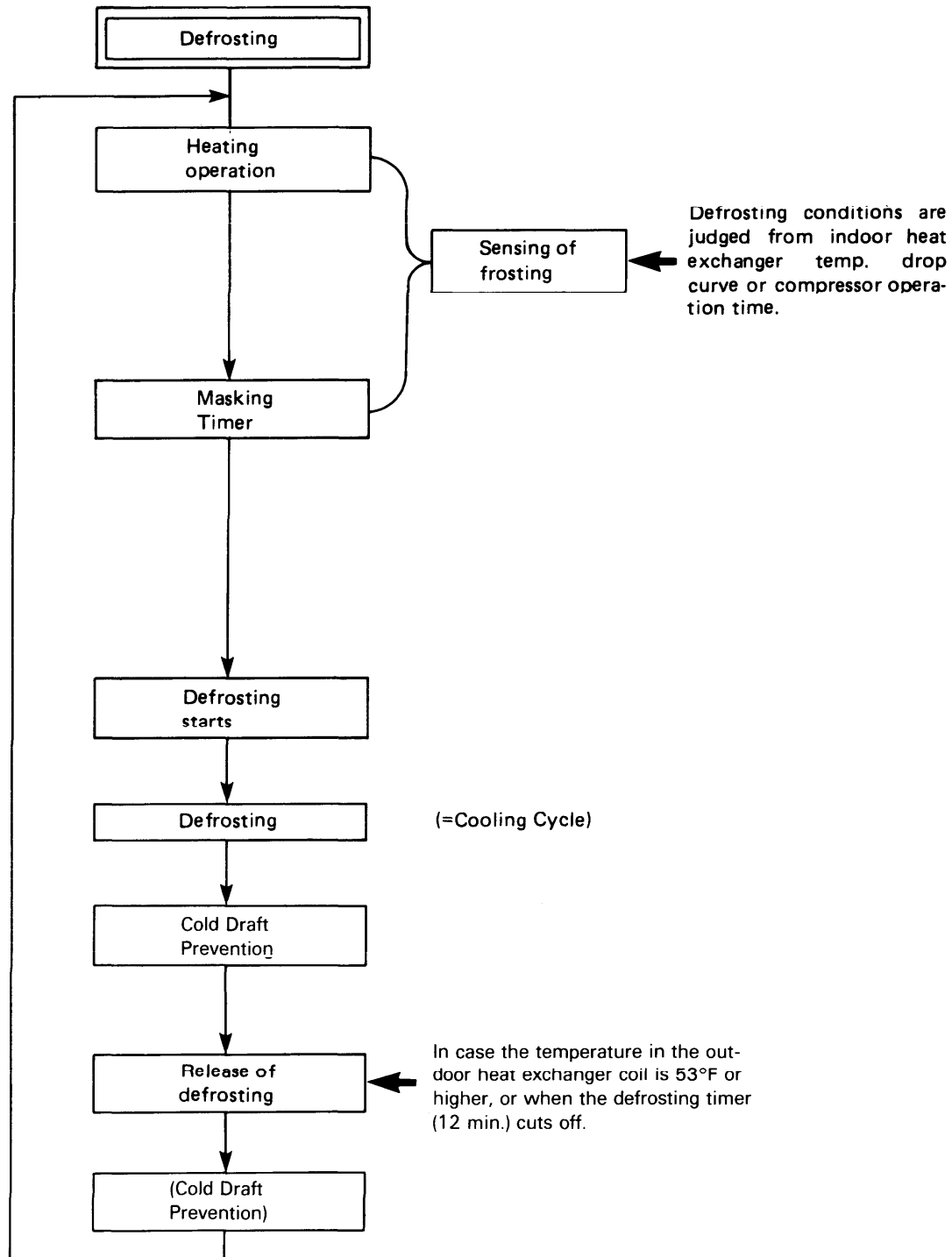
- When the standby lamp lights up, the indoor fan speed changes automatically to LL, and blowout of cool air is prevented. Refer to page 26, 31 and 40.



9) Defrosting Mode (Heating)

When the capacity of unit has been decreased due to frost sticking to the outdoor heat exchanger during heating, the temperature drop gradient is detected by the microcomputer controlled temperature sensing system, and defrosting operation is started. At this time, the indoor and outdoor fan motors will stop, only the compressor is operated, and the system is automatically changed to cooling operation mode.

Flow of Defrosting



- Timing chart of Defrosting.

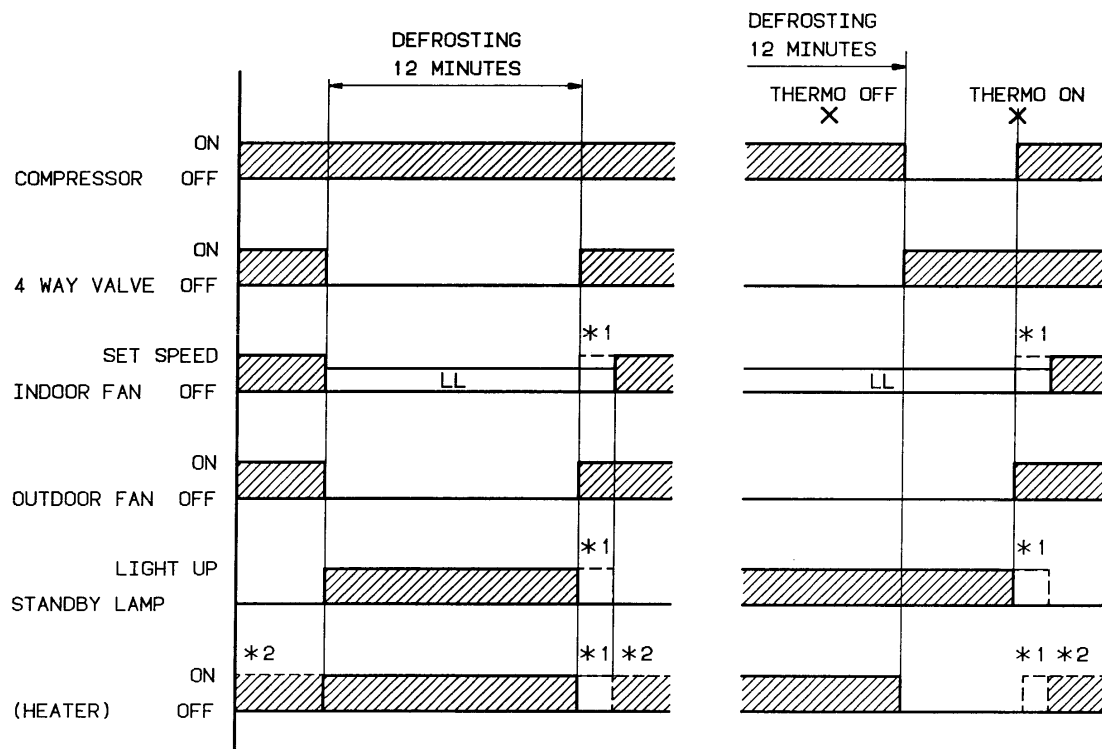


Fig. 13

Note: *1. In case of Cold Draft Prevention.
 *2. There is the case of Heater OFF.

10. INSTALLATION INSTRUCTIONS

1) Piping Length

- Refrigerant pipes between the indoor and the outdoor units shall be kept as short as possible.
- Standard length of piping is designed as 50 ft. Refrigerant has factory charged in the outdoor unit at the time of shipment.
- If the pipe length will exceed more than 50 ft. additional refrigerant charge is necessary. (Refer to the below table and Fig. 1.)

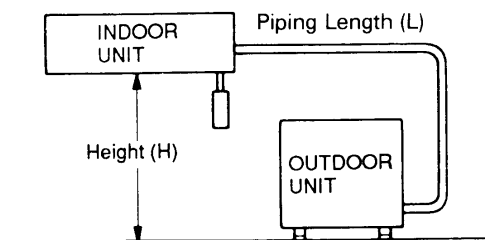


Fig. 1

Max allowable piping length at shipment (ft)	Limit of piping length (L) (ft)	Limit of elevation difference (H) (ft)	Required amount of additional refrigerant* (oz./ft)	Refrigerant amount charged at shipment (lb)
10 ~ 50	100	50	0.38	7.48

* No additional charge of compressor oil is required.

Table 1

2) Installation Site Selection

INDOOR UNIT

AVOID:

- areas where leakage of flammable gas may be expected.
- places where large amounts of oil mist exist.
- direct sunlight.
- nearby heat sources that may affect performance of the unit.
- locations where remote control will be splashed with water or affected by dampness or humidity.
- installing remote control unit behind curtains or furniture that obstruct air circulation.

DO:

- select an appropriate position from which every corner of the room can be uniformly cooled. (High on the wall is best.)
- Select a location that will hold the weight of the unit.
- select a location where piping and drain pipe have shortest run to the outside. Fig. 2.
- allow room for operation and maintenance as well as unrestricted air flow around the unit. Fig. 3
- allow room for mounting control unit about 4' off the floor, in an area that is not in direct sunlight or in the flow of cold (or hot) air from the unit.

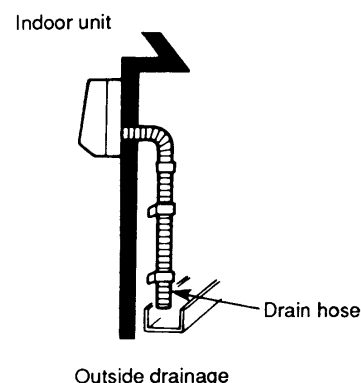


Fig. 2

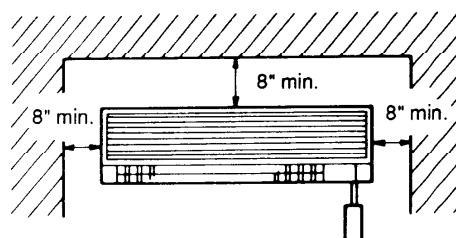


Fig. 3

OUTDOOR UNIT

AVOID:

- heat sources, exhaust fans, etc., Fig. 4
- damp, humid or uneven locations.

DO:

- choose a place that is well ventilated and outside air temperature does not exceed 115°F constantly.
- allow enough room around unit for air intake/exhaust and possible maintenance. Fig. 5
- provide a solid base; about 4" above ground level to reduce humidity and possible water damage in unit and decrease service life.
- use lug bolts or equal to bolt down unit, reducing vibration and noise.

Unit Installation in Areas of Heavy Snowfall or Extrme Cold

- A. Countermeasure against snow and cold
- In areas where there is sleet, snowstorms or heavy snowfall, etc., install a platform for the outdoor unit and a snow-proof duct.
 - Troubles such as the following may arise if there is no platform or snow-proof duct. Fig. 6-A
 - Draft flow stops and heat absorption is no longer possible.
 - Even if defrosting takes place, only the area near the fin melts and frost remains on the greater part of the unit.
 - Refrigerant piping is deformed.
- B. Precautions for installing platform and snow-proof duct.
- Set the height of the platform so that it is higher than the highest level of snowfall. Fig. 6-B
 - If the platform is larger than the bottom space of the unit, snow will gather on the platform and defrost water will freeze over again on it. Make the platform smaller than the bottom space. On the bottom plate of this model, drain holes have been opened so that defrost water can drain out easily. Construct the platform which does not block off these holes. Fig. 6-C
 - Set the intake opening of the snow-proof duct facing downwards, and make the opening area large. Fig. 6-B
 - Since wind comes into the snow-proof duct through the exhaust part, be sure to provide a few holes for releasing air. Fig. 6-B
 - Be sure to have a firm foundation because installation of the duct increases the wind pressure. Paint the duct to prevent rusting.

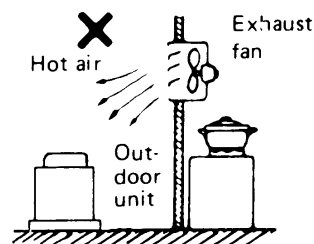


Fig. 4

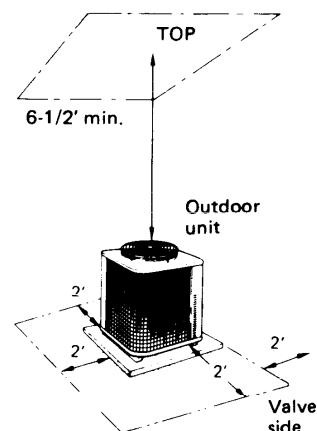


Fig. 5

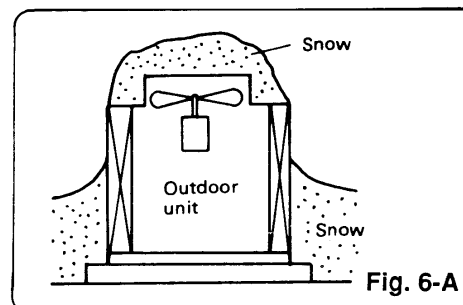


Fig. 6-A

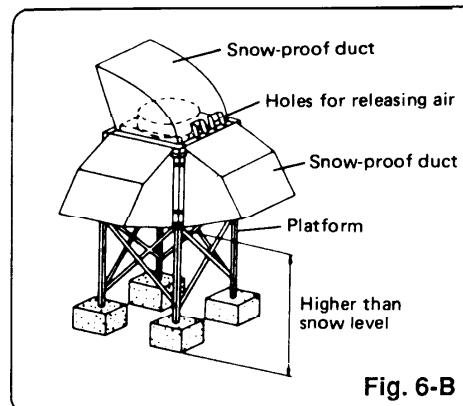


Fig. 6-B

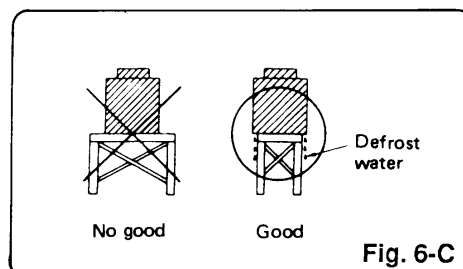


Fig. 6-C

3) Connecting Pipes between Indoor and Outdoor Units

1. Connect the indoor side refrigerant piping extended from the wall with the outdoor side piping tightly.
2. Flare nut on large dia. pipe should be torqued to 510 ~ 550 lbs. in. Flare nut small dia. pipe should be torqued to 130 ~ 170 lbs. in Fig. 7
3. After performing a leak test on the connecting part, insulate it with INSUL. NIPPLE and finish with a vinyl masking tape over it. Fig. 8

CAUTION

Never connect up pipes by brazing them. If it is inevitable, be sure to blow nitrogen gas while brazing to avoid oxidation of inside copper tube.

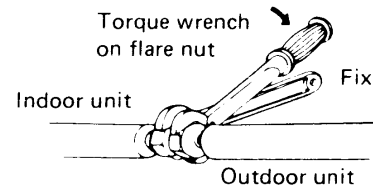


Fig. 7

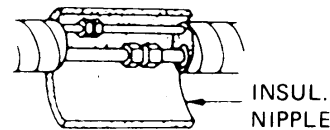


Fig. 8

4) Insulation of Refrigerant Piping

To prevent heat loss and wet floors due to dripping of condensation, wide pipe must be well insulated with proper insulation material. Thickness of insulation material should be min. 5/16". Fig. 9

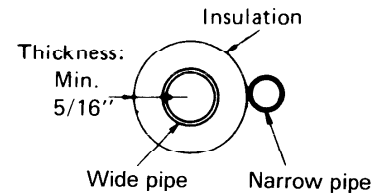


Fig. 9

5) Wiring Instructions

Wiring system diagram

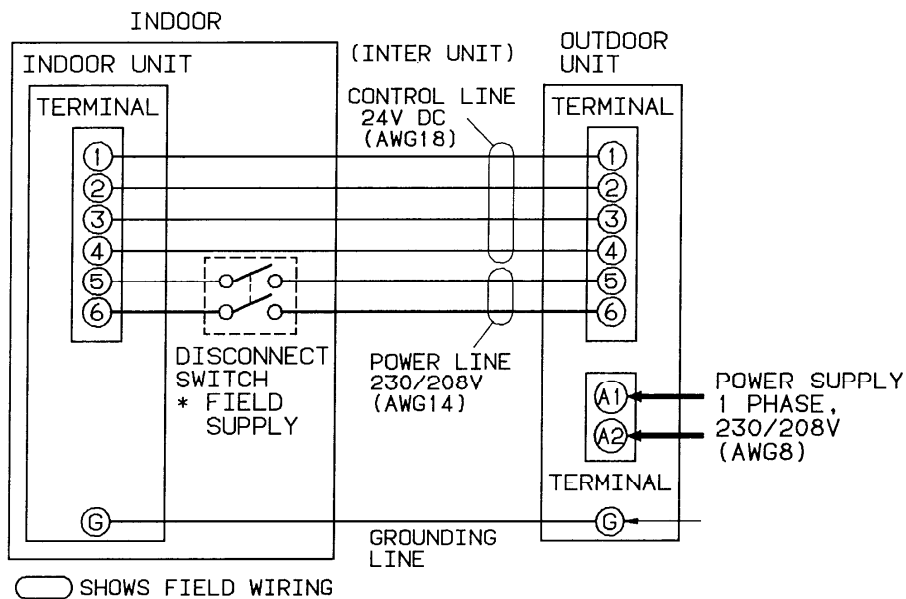


Fig. 10

6) Air Purging

Air does not function as a refrigerant, because it cannot be liquefied in the condenser. Air and moisture remaining in the refrigerant system have undesirable effects as indicated at right. Therefore, they must be purged completely.

- The pressure in the narrow **pipe rises**.
- The operating current rises.
- Cooling and heating efficiency drops.
- Water contained in the air may freeze and block the capillary tubing.
- Water may lead to corrosion of parts in the refrigerant circuit.

CAUTION: Refrigerant has factory charged in the outdoor unit at the time of shipment. Don't use this refrigerant gas for air purging.

■ PIPING DIAGRAM FOR AIR PURGING

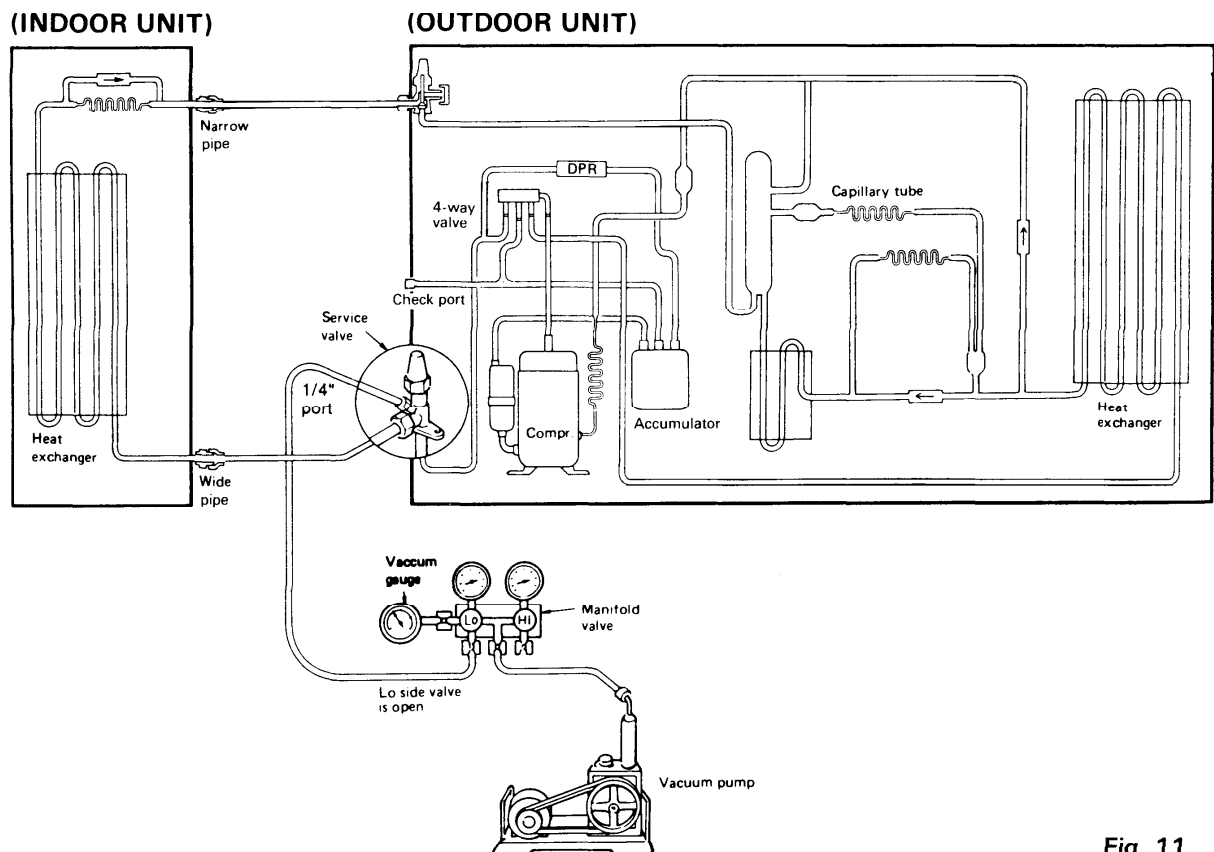


Fig. 11

6-1. Air Purging Procedure (Conventional evacuation system)

- a) Check gas leakage of all joints with liquid soap. Fig. 12
- b) If no gas leakage is confirmed, connect both vacuum pump and vacuum gauge to service valve through 1/4" port with a flare nut.
- c) Next, run the vacuum pump until the pressure reaches to 1.5 mmHg abs. or less value than that.
- d) Close the low pressure side knob on the gauge manifold valve and stop evacuation.
- e) Remove the cap from the wide pipe service valve and turn the spindle gradually until it is back seated. Fig. 13
- f) Disconnect vacuum pump and gauge manifold valve from the service valve. Then replace bonnet and flare nut to 1/4" port of service valve.
- g) The stem of narrow pipe service valve shall be fully back seated. Then, tighten the valve seal cap with the copper gasket.
- h) The all air purge procedure has been completed and the unit is ready for trial operation.

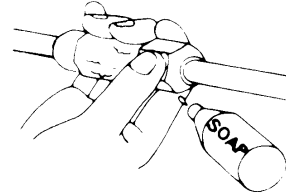


Fig. 12

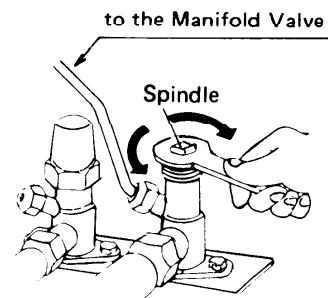


Fig. 13

6-2. Air Purging Procedure (If piping length will not exceed more than 50 ft.)

- a) Connect refrigerant charging cylinder to narrow pipe service valve, and open the valve of the charging cylinder. Fig. 14
- b) When gas begins to be expelled, stop the flow for about 5 seconds by holding your finger over the outlet, then remove it and allow gas to flow out freely for about 10 seconds. Repeat this operation 6 or 7 times.
- c) Tighten the flare nuts quickly with bonnets on both charging ports right after hold no pressure before air comes in.
- d) The stem of both service valves shall be fully back seated. Then, tighten the valve seal cap with the copper gasket.

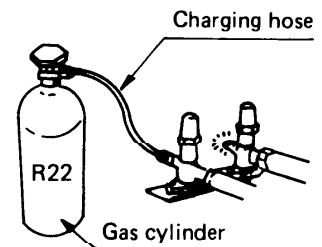


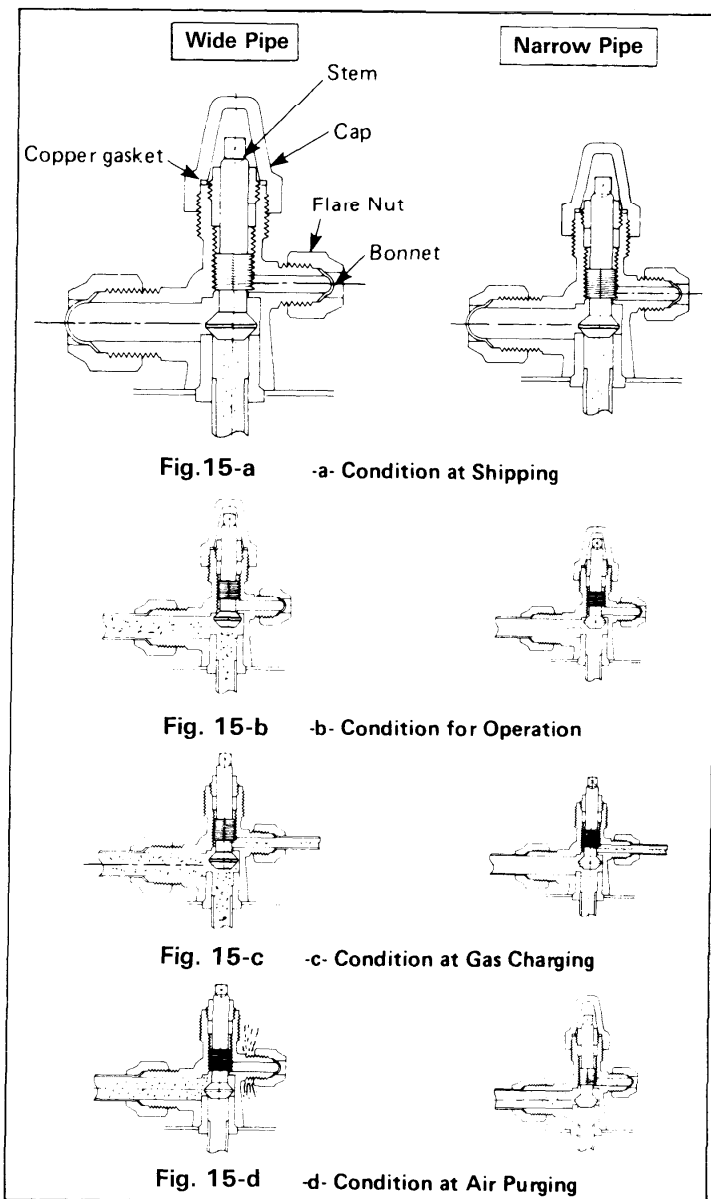
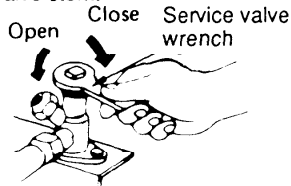
Fig. 14

■ SERVICE VALVE CONSTRUCTION

- **Valve Position -a-**
The valve stems of both wide & narrow pipes are turned all the way in. The unit is shipped from the factory in this position. Fig. 15-a
- **Valve Position -b-**
The valve stems of both wide & narrow pipes are turned all the way out ("BACK SEAT" position). This is the normal operating position. Fig. 15-b
- **Valve Position -c-**
The valve stems of both wide & narrow pipes are turned halfway-down position. This position is used for pressure measurement and gas charging. Fig. 15-c
- **Valve Position -d-**
Like position -a-, but with the flare nut of wide pipe open. This position is used for air purging. Fig. 15-d

CAUTION :

Be sure to use the service valve wrench or ratchet wrench when opening or closing the service valve stem.



■ PUMP DOWN

Pump down means collecting all refrigerant in the system back into the outdoor unit without losing refrigerant gas. Pump down is used when unit is moved or for servicing the refrigerant circuit.

CAUTION :

Set the COOLING/HEATING selector lever to the 'COOL' side and operate in cooling mode.

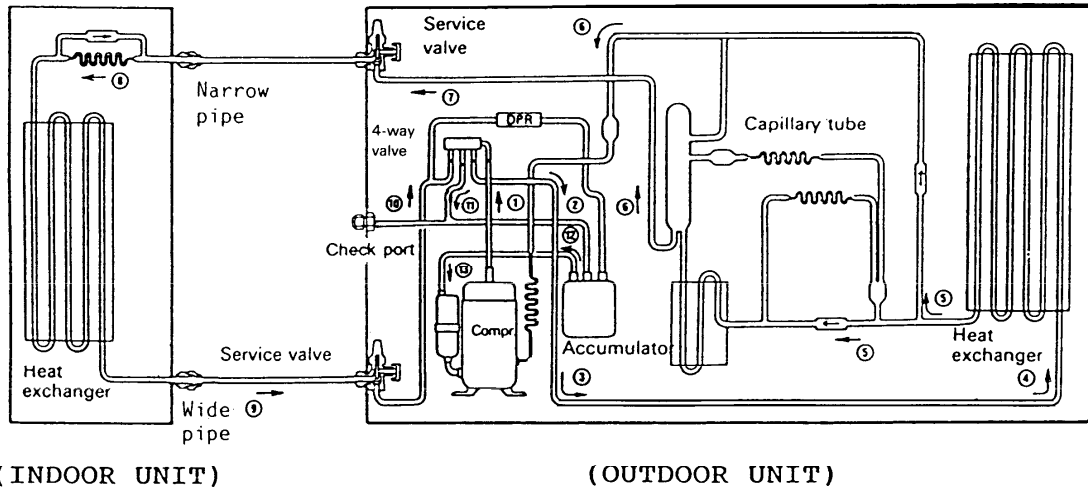
- 1) Close valve on wide pipe halfway (2 turns).
- 2) Close valve on narrow pipe all the way (4 turns).
- 3) Turn unit on (cooling) for approximately 3 minutes then shut off.
- 4) Close valve on wide pipe all the way (2 additional turns).
- 5) Disconnect pipes slowly allowing pressure to equalize inside and out.
- 6) When piping is disconnected provide dust covers for both valves and pipes until unit is reconnected.

7) Trial Run

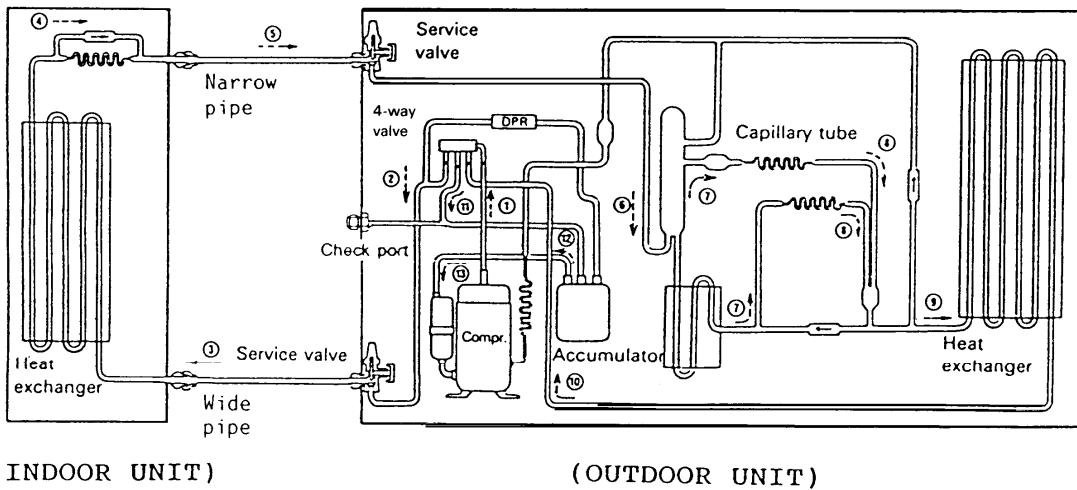
- 1) Check that all piping and wiring have been completed correctly.
- 2) Check again that wide and narrow pipe service valves are fully open.
- 3) Turn on power mains or circuit breaker.
- 4) Operate the heat pump and check that it works normally.

11. REFRIGERANT FLOW DIAGRAM

COOLING CYCLE

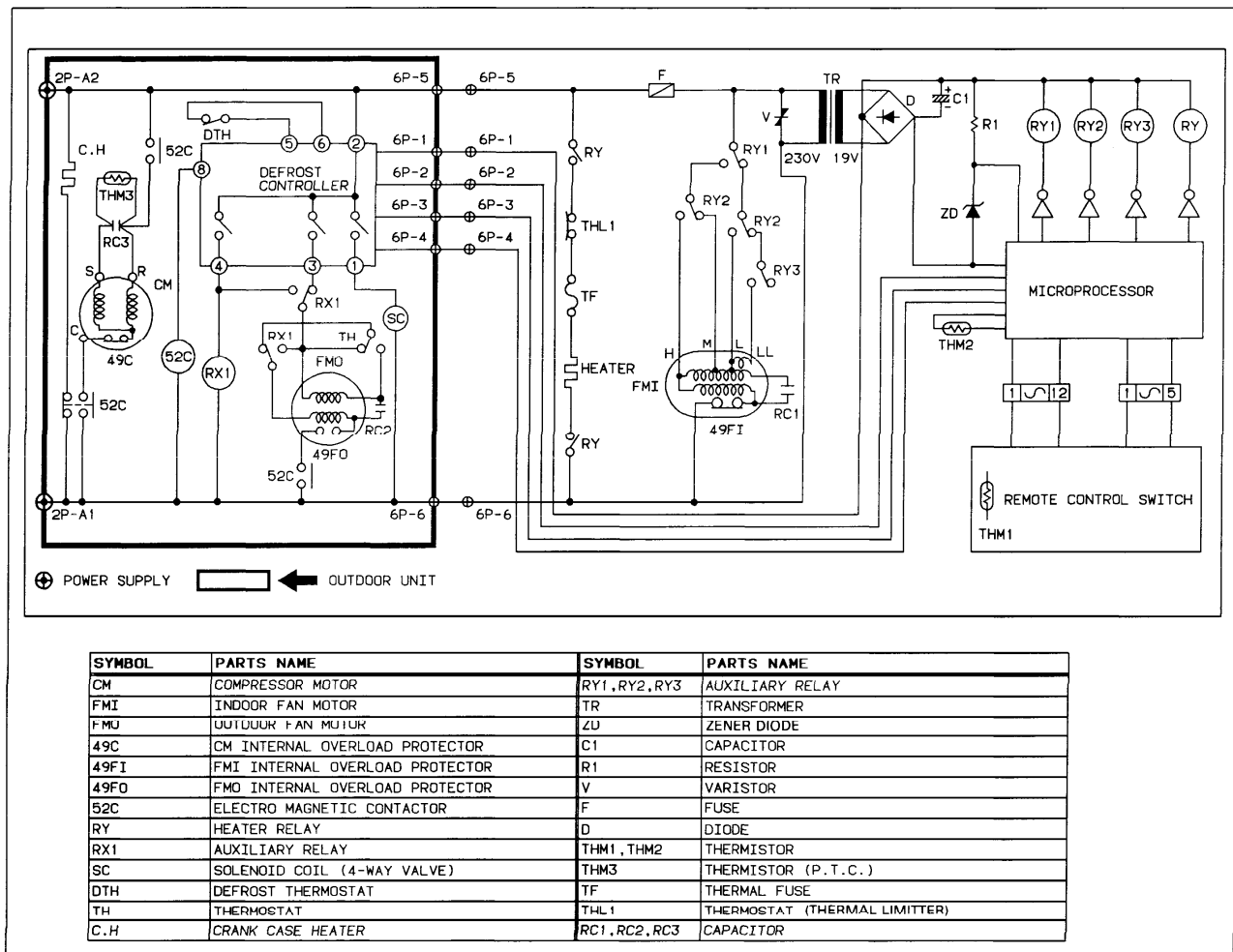


HEATING CYCLE



12. ELECTRICAL DATA

Schematic Diagram



Electrical Wiring Diagram

POW-K243GH		
SYMBOLS	DESCRIPTION	SPECIFICATIONS
R1	RESISTOR	100K 1/4W 5%
R2	RESISTOR	1K 1/4W 5%
R3	RESISTOR	3K 1/4W 5%
R4	RESISTOR	5K 1/4W 5%
R5	RESISTOR	10K 1/4W 5%
R6	RESISTOR	15K 1/4W 5%
R7	RESISTOR	20K 1/4W 5%
R8	RESISTOR	25K 1/4W 5%
R9	RESISTOR	30K 1/4W 5%
R10	RESISTOR	35K 1/4W 5%
R11	RESISTOR	40K 1/4W 5%
R12	RESISTOR	45K 1/4W 5%
R13	RESISTOR	50K 1/4W 5%
R14	RESISTOR	55K 1/4W 5%
R15	RESISTOR	60K 1/4W 5%
R16	RESISTOR	65K 1/4W 5%
R17	RESISTOR	70K 1/4W 5%

POW-K243GH		
SYMBOLS	DESCRIPTION	SPECIFICATIONS
R18	RESISTOR	75K 1/4W 5%
R19	RESISTOR	80K 1/4W 5%
R20	RESISTOR	85K 1/4W 5%
R21	RESISTOR	90K 1/4W 5%
R22	RESISTOR	95K 1/4W 5%
R23	RESISTOR	100K 1/4W 5%
R24	RESISTOR	105K 1/4W 5%
R25	RESISTOR	110K 1/4W 5%
R26	RESISTOR	115K 1/4W 5%
R27	RESISTOR	120K 1/4W 5%
R28	RESISTOR	125K 1/4W 5%
R29	RESISTOR	130K 1/4W 5%
R30	RESISTOR	135K 1/4W 5%
R31	RESISTOR	140K 1/4W 5%
R32	RESISTOR	145K 1/4W 5%
R33	RESISTOR	150K 1/4W 5%
R34	RESISTOR	155K 1/4W 5%

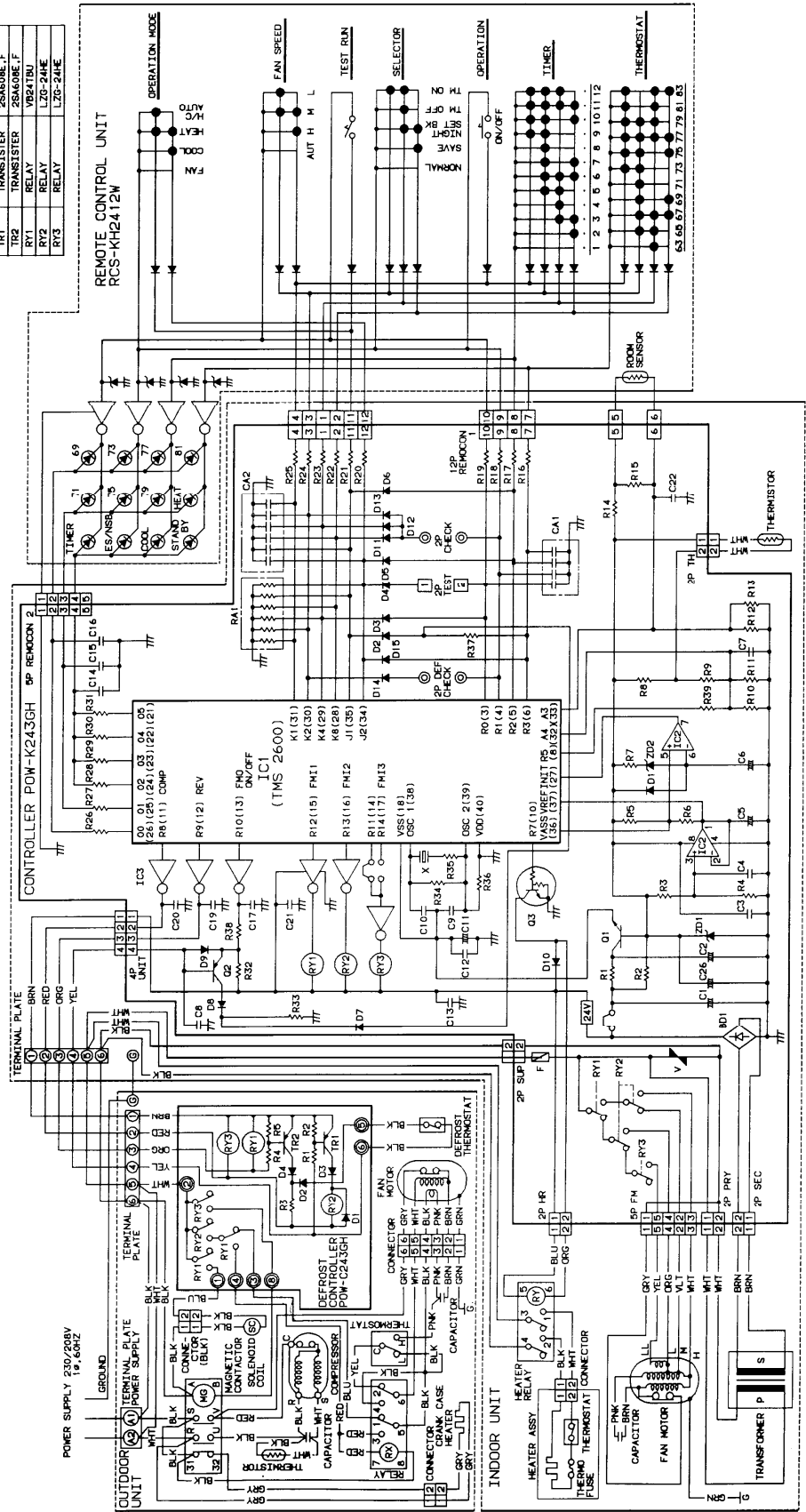
POW-K243GH		
SYMBOLS	DESCRIPTION	SPECIFICATIONS
C1	CAPACITOR	100N 1/4W 5%
C2	CAPACITOR	100N 1/4W 5%
C3	CAPACITOR	100N 1/4W 5%
C4	CAPACITOR	100N 1/4W 5%
C5	CAPACITOR	100N 1/4W 5%
C6	CAPACITOR	100N 1/4W 5%
C7	CAPACITOR	100N 1/4W 5%
C8	CAPACITOR	100N 1/4W 5%
C9	CAPACITOR	100N 1/4W 5%
C10	CAPACITOR	100N 1/4W 5%
C11	CAPACITOR	100N 1/4W 5%
C12	CAPACITOR	100N 1/4W 5%
C13	CAPACITOR	100N 1/4W 5%
C14	CAPACITOR	100N 1/4W 5%
C15	CAPACITOR	100N 1/4W 5%
C16	CAPACITOR	100N 1/4W 5%
C17	CAPACITOR	100N 1/4W 5%
C18	CAPACITOR	100N 1/4W 5%
C19	CAPACITOR	100N 1/4W 5%
C20	CAPACITOR	100N 1/4W 5%
C21	CAPACITOR	100N 1/4W 5%
C22	CAPACITOR	100N 1/4W 5%
C23	CAPACITOR	100N 1/4W 5%
C24	CAPACITOR	100N 1/4W 5%
C25	CAPACITOR	100N 1/4W 5%
C26	CAPACITOR	100N 1/4W 5%
C27	CAPACITOR	100N 1/4W 5%
C28	CAPACITOR	100N 1/4W 5%
C29	CAPACITOR	100N 1/4W 5%
C30	CAPACITOR	100N 1/4W 5%

POW-K243GH		
SYMBOLS	DESCRIPTION	SPECIFICATIONS
D1	DIODE	1N4148
D2	DIODE	1N4148
D3	DIODE	1N4148
D4	DIODE	1N4148
D5	DIODE	1N4148
D6	DIODE	1N4148
D7	DIODE	1N4148
D8	DIODE	1N4148
D9	DIODE	1N4148
D10	DIODE	1N4148
D11	DIODE	1N4148
D12	DIODE	1N4148
D13	DIODE	1N4148
D14	DIODE	1N4148
D15	DIODE	1N4148
D16	DIODE	1N4148
D17	DIODE	1N4148
D18	DIODE	1N4148
D19	DIODE	1N4148
D20	DIODE	1N4148
D21	DIODE	1N4148
D22	DIODE	1N4148
D23	DIODE	1N4148
D24	DIODE	1N4148
D25	DIODE	1N4148
D26	DIODE	1N4148
D27	DIODE	1N4148
D28	DIODE	1N4148
D29	DIODE	1N4148
D30	DIODE	1N4148

POW-K243GH		
SYMBOLS	DESCRIPTION	SPECIFICATIONS
Q1	TRANSISTOR	2N2222
Q2	TRANSISTOR	2N2222
Q3	TRANSISTOR	2N2222
Q4	TRANSISTOR	2N2222
Q5	TRANSISTOR	2N2222
Q6	TRANSISTOR	2N2222
Q7	TRANSISTOR	2N2222
Q8	TRANSISTOR	2N2222
Q9	TRANSISTOR	2N2222
Q10	TRANSISTOR	2N2222
Q11	TRANSISTOR	2N2222
Q12	TRANSISTOR	2N2222
Q13	TRANSISTOR	2N2222
Q14	TRANSISTOR	2N2222
Q15	TRANSISTOR	2N2222
Q16	TRANSISTOR	2N2222
Q17	TRANSISTOR	2N2222
Q18	TRANSISTOR	2N2222
Q19	TRANSISTOR	2N2222
Q20	TRANSISTOR	2N2222
Q21	TRANSISTOR	2N2222
Q22	TRANSISTOR	2N2222
Q23	TRANSISTOR	2N2222
Q24	TRANSISTOR	2N2222
Q25	TRANSISTOR	2N2222
Q26	TRANSISTOR	2N2222
Q27	TRANSISTOR	2N2222
Q28	TRANSISTOR	2N2222
Q29	TRANSISTOR	2N2222
Q30	TRANSISTOR	2N2222

POW-K243GH		
SYMBOLS	DESCRIPTION	SPECIFICATIONS
U1	IC	74LS00
U2	IC	74LS00
U3	IC	74LS00
U4	IC	74LS00
U5	IC	74LS00
U6	IC	74LS00
U7	IC	74LS00
U8	IC	74LS00
U9	IC	74LS00
U10	IC	74LS00
U11	IC	74LS00
U12	IC	74LS00
U13	IC	74LS00
U14	IC	74LS00
U15	IC	74LS00
U16	IC	74LS00
U17	IC	74LS00
U18	IC	74LS00
U19	IC	74LS00
U20	IC	74LS00
U21	IC	74LS00
U22	IC	74LS00
U23	IC	74LS00
U24	IC	74LS00
U25	IC	74LS00
U26	IC	74LS00
U27	IC	74LS00
U28	IC	74LS00
U29	IC	74LS00
U30	IC	74LS00

POW-K243GH		
SYMBOLS	DESCRIPTION	SPECIFICATIONS
REL1	RELAY	12VDC 10A
REL2	RELAY	12VDC 10A
REL3	RELAY	12VDC 10A
REL4	RELAY	12VDC 10A
REL5	RELAY	12VDC 10A
REL6	RELAY	12VDC 10A
REL7	RELAY	12VDC 10A
REL8	RELAY	12VDC 10A
REL9	RELAY	12VDC 10A
REL10	RELAY	12VDC 10A
REL11	RELAY	12VDC 10A
REL12	RELAY	12VDC 10A
REL13	RELAY	12VDC 10A
REL14	RELAY	12VDC 10A
REL15	RELAY	12VDC 10A
REL16	RELAY	12VDC 10A
REL17	RELAY	12VDC 10A
REL18	RELAY	12VDC 10A
REL19	RELAY	12VDC 10A
REL20	RELAY	12VDC 10A
REL21	RELAY	12VDC 10A
REL22	RELAY	12VDC 10A
REL23	RELAY	12VDC 10A
REL24	RELAY	12VDC 10A
REL25	RELAY	12VDC 10A
REL26	RELAY	12VDC 10A
REL27	RELAY	12VDC 10A
REL28	RELAY	12VDC 10A
REL29	RELAY	12VDC 10A
REL30	RELAY	12VDC 10A



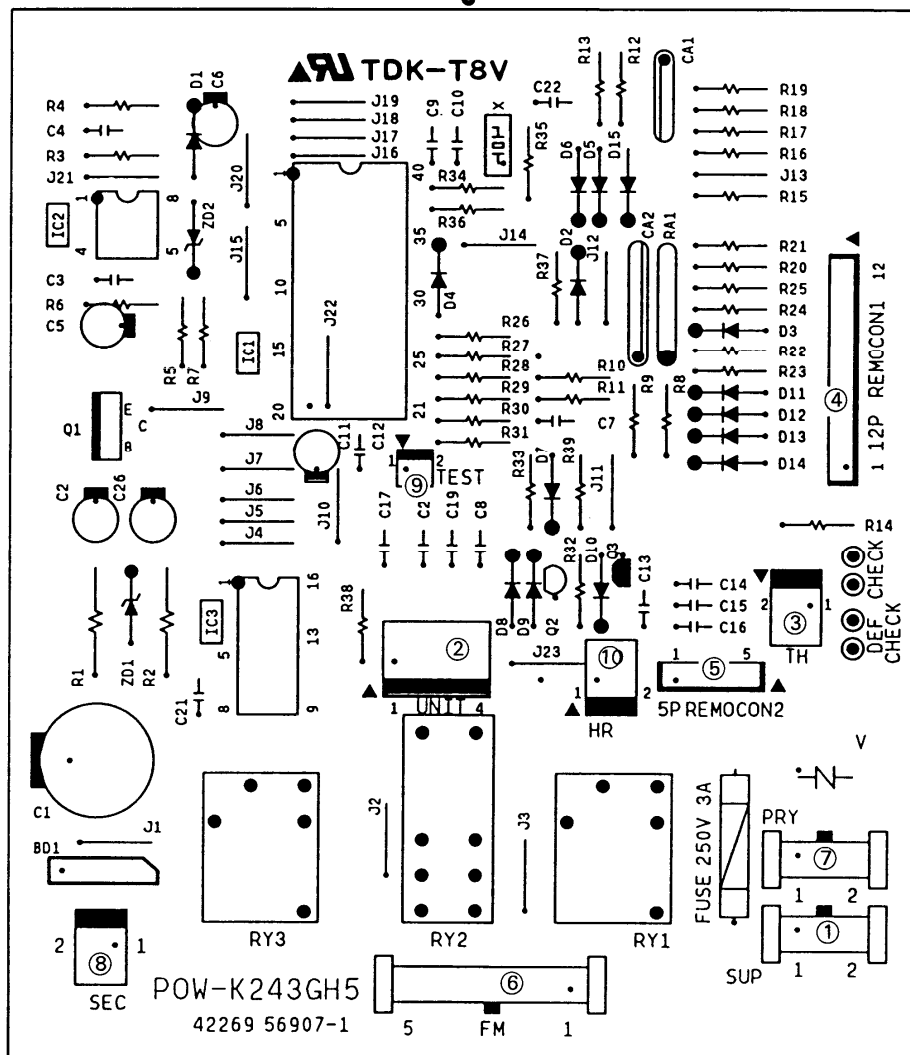
Electrical Characteristics

Performance at 230 / 208V 1 ϕ - 60Hz			Indoor Unit		Outdoor Unit		Complete Unit	
			Fan Motor	Max. Heat	Fan Motor	Compressor	Cool or Heat	Max. Heat
Cool	Rated Load	A	0.40/0.40	-	1.2/1.2	8.9/9.8	10.5/11.4	-
		W	80/70	-	250/230	2,070/2,050	2,400/2,350	-
Heat	Rated Load	A	0.40/0.40	7.8/7.1	1.2/1.2	10.1/11.9	11.7/13.5	19.5/20.6
		W	80/70	1,800/1,473	250/230	2,220/2,250	2,550/2,550	4,350/4,023
Locked Rotor Amps.		A	0.46/0.42	-	2.34/2.29	72	-	-

Remarks: Rated Conditions : Cool, Outdoor unit entering air temperature 95°F D.B./75°F W.B.
Indoor unit entering air temperature 80°F D.B./67°F W.B.
Heat, Outdoor unit entering air temperature 47°F D.B./43°F W.B.
Indoor unit entering air temperature 70°F D.B.

P.C.B. Ass'y (Printed Pattern)

POW-K243GH5



- ① Connector, Power Supply to P.C.B.*
- ② Connector, Outdoor Unit Control, 24 V.D.C.
- ③ Connector, Thermistor, 9 V.D.C.
- ④ Connector, Remote Control Unit (12p), 9 V.D.C.
- ⑤ Connector, Remote Control Unit (5p), 9 V.D.C.
- ⑥ Connector, Fan Motor*
- ⑦ Connector, Transformer (Primary*)
- ⑧ Connector, Transformer (Secondary, 19 V.A.C.)
- ⑨ Connector, Test, 9 V.D.C.
- ⑩ Connector, Heater Relay, 24 V.D.C.

* The asterisk "*" indicates that line voltage is applied.

13. TROUBLESHOOTING

— Quick Access Index —

	Page
1. Air conditioner does not operate	54
(1) Circuit breaker trips (or fuse blows)	54
a) When circuit breaker is set to ON, it is tripped soon (Resetting is not possible)	54
b) Circuit breaker trips when the operation switch is depressed	55
(2) Neither indoor unit nor outdoor unit runs	56
2. Some part of air conditioner does not operate	57
(1) Indoor fan does not run	57
(2) Neither outdoor fan nor compressor runs	58
(3) Only outdoor fan does not run	59
(4) Only compressor does not run	60
(5) Compressor frequently repeats ON and OFF	61
3. Air conditioner operates, but abnormalities are observed	62
(1) Heating operation cannot be done	62
(2) Poor cooling	63
(3) Excessive cooling	64
(4) Poor heating	65
(5) The electric heater does not work	66

Note: Check the following operations at first.

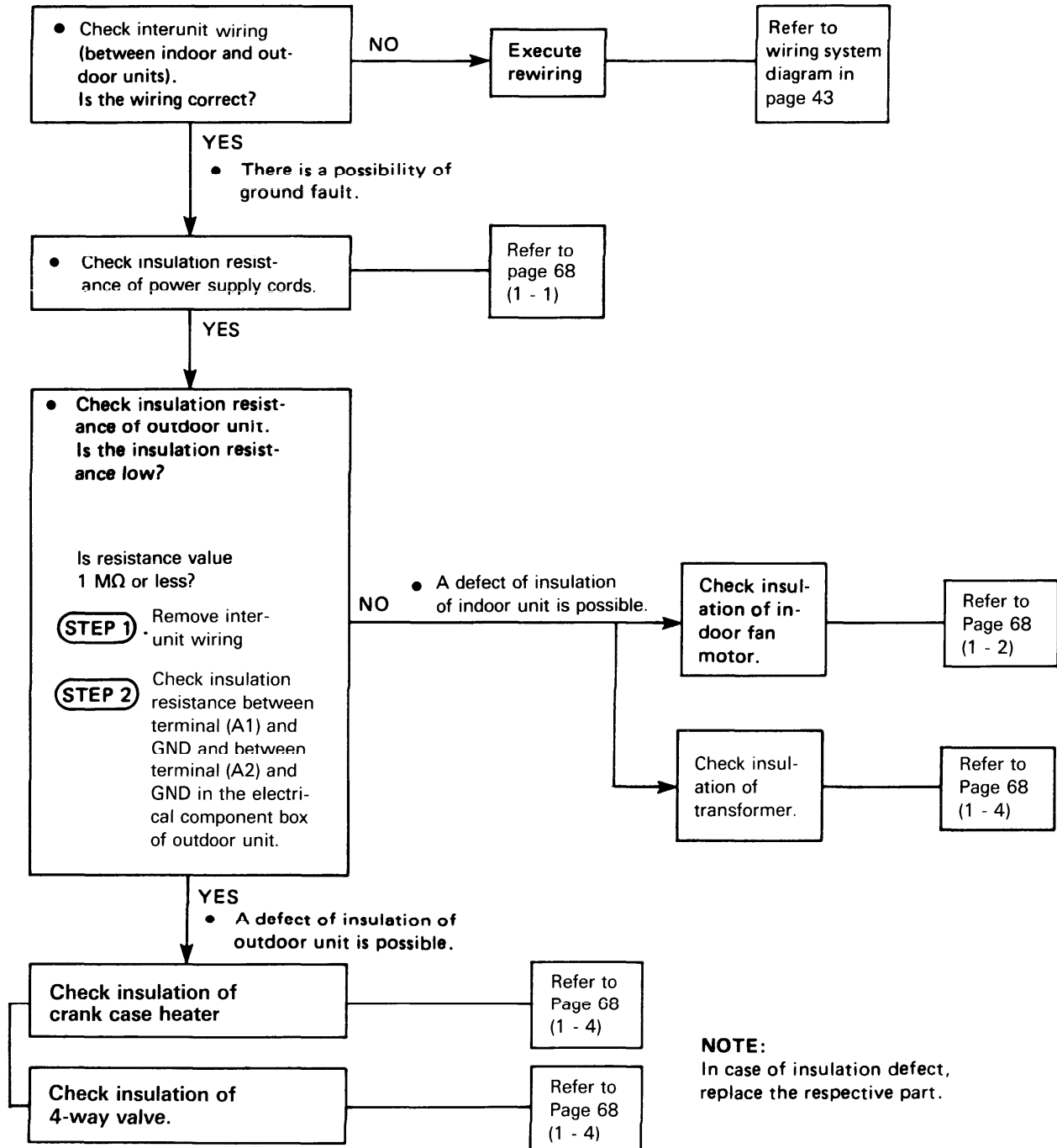
	Operations	
	Cooling	* Heating
1-(2) Neither indoor unit nor outdoor unit runs.	—	Thermo. OFF 5 minutes OFF timer
2-(1) Indoor fan does not run.	—	Cold Draft Prevention
2-(2) Neither outdoor fan nor compressor runs.	Thermo. OFF 3 minutes OFF timer Freeze Prevention	—
3-(1) Heating operation cannot be done.	—	Defrosting Mode

* In case of each modes of heating operation, be sure that the indoor fan is running at LL. It is normal. Refer to 9. FUNCTION

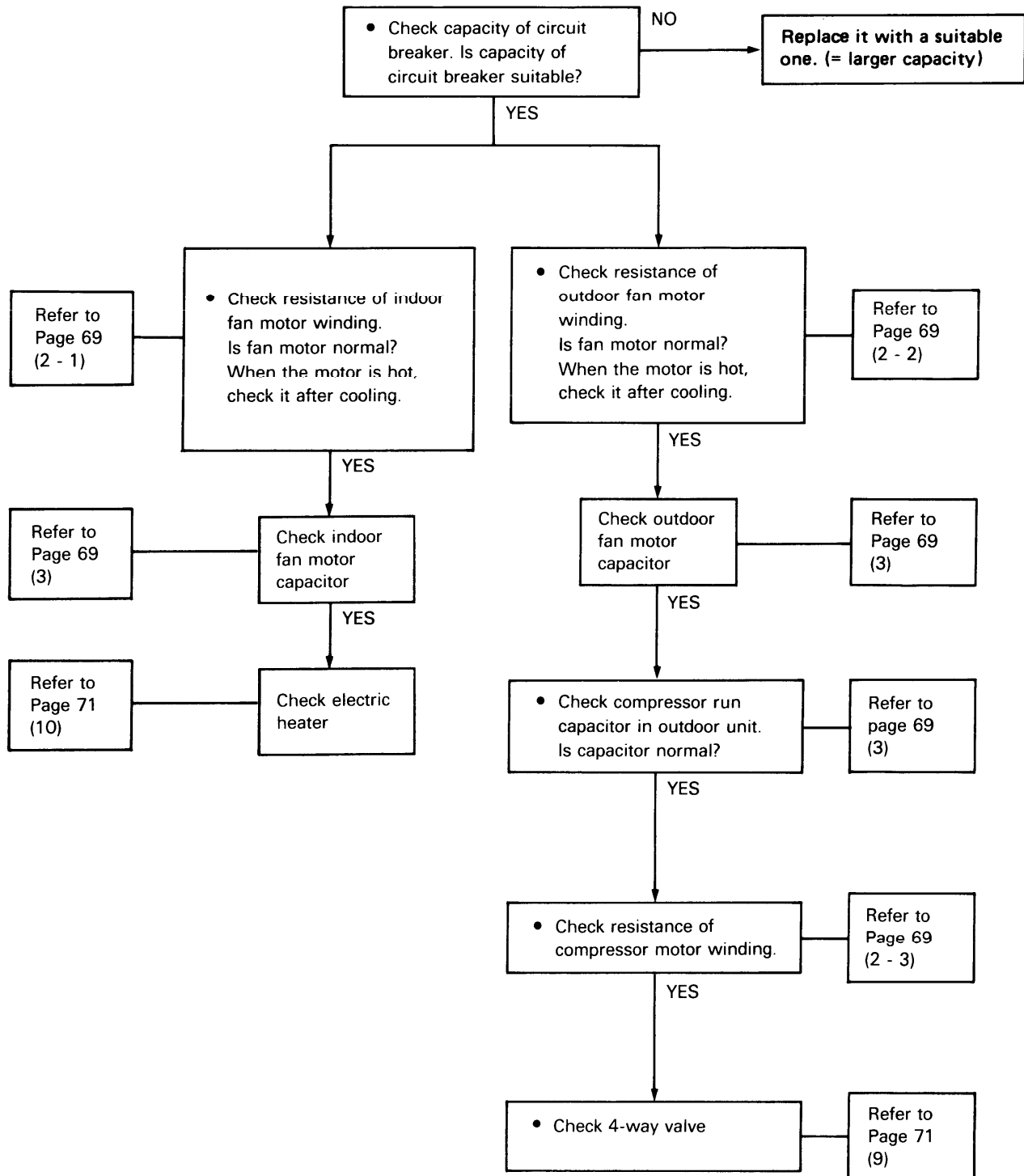
1. Air conditioner does not operate

(1) Circuit breaker trips (or fuse blows)

- a) When circuit breaker is set to ON, it is tripped soon
(Resetting is not possible)

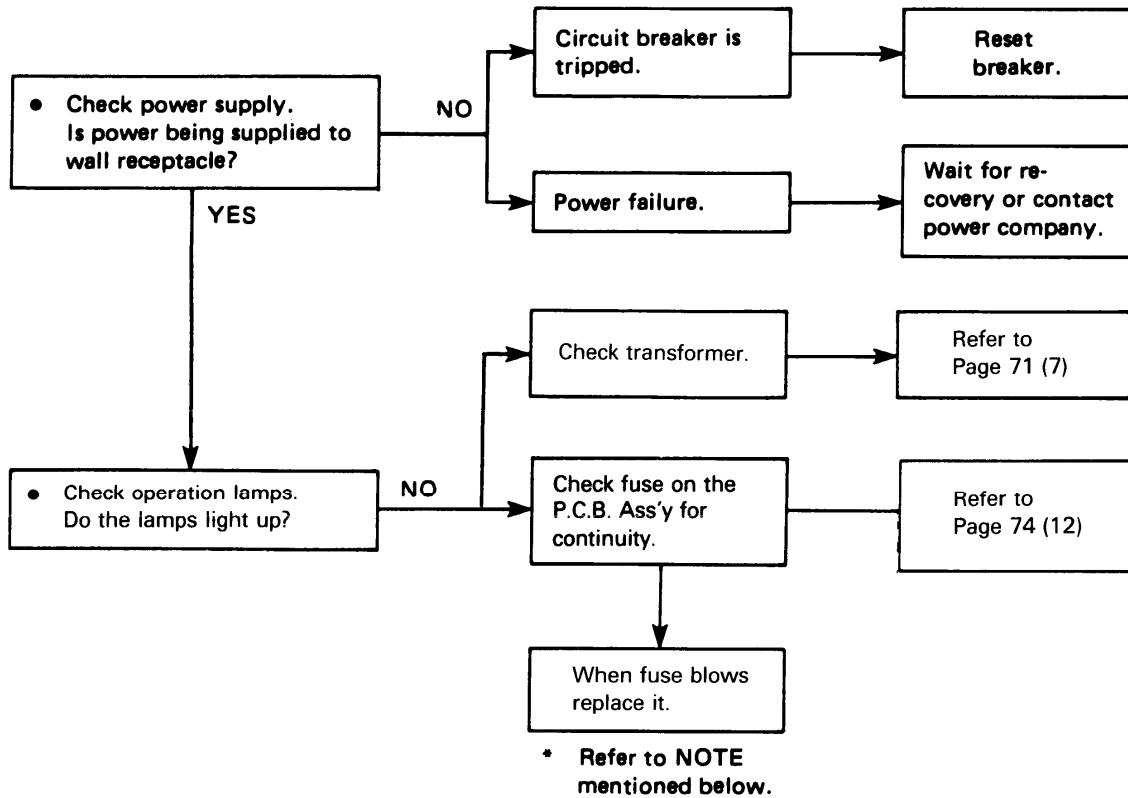


b) Circuit breaker trips when the operation switch is depressed.

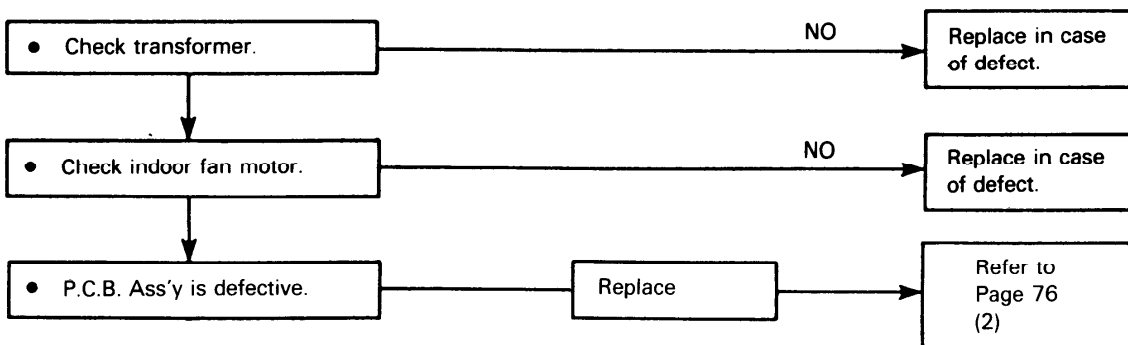


NOTE: In case of defect, replace the respective part.

(2) Neither indoor unit nor outdoor unit runs

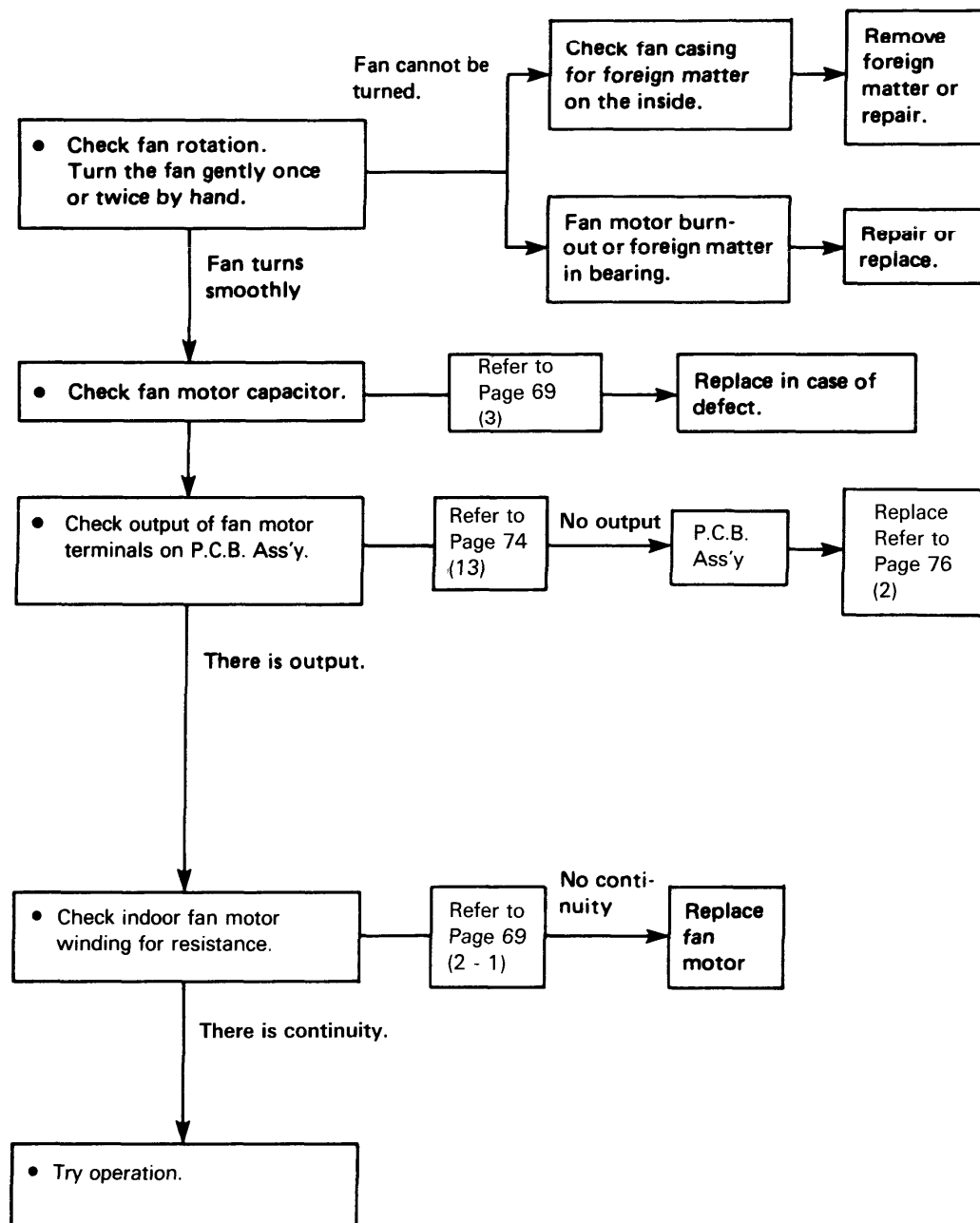


NOTE: If fuse blows again, check the following items:

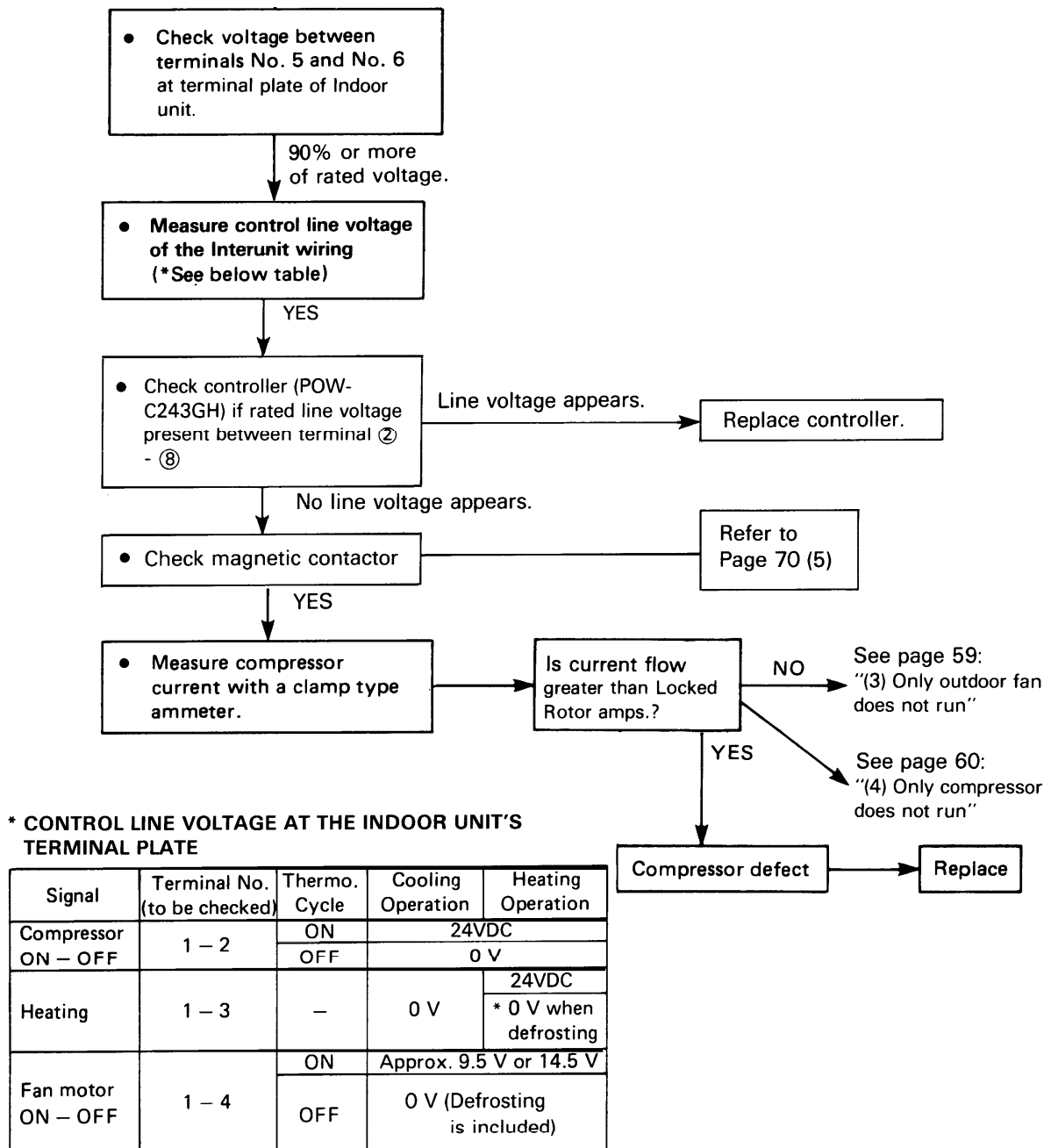


2. Some part of air conditioner does not operate

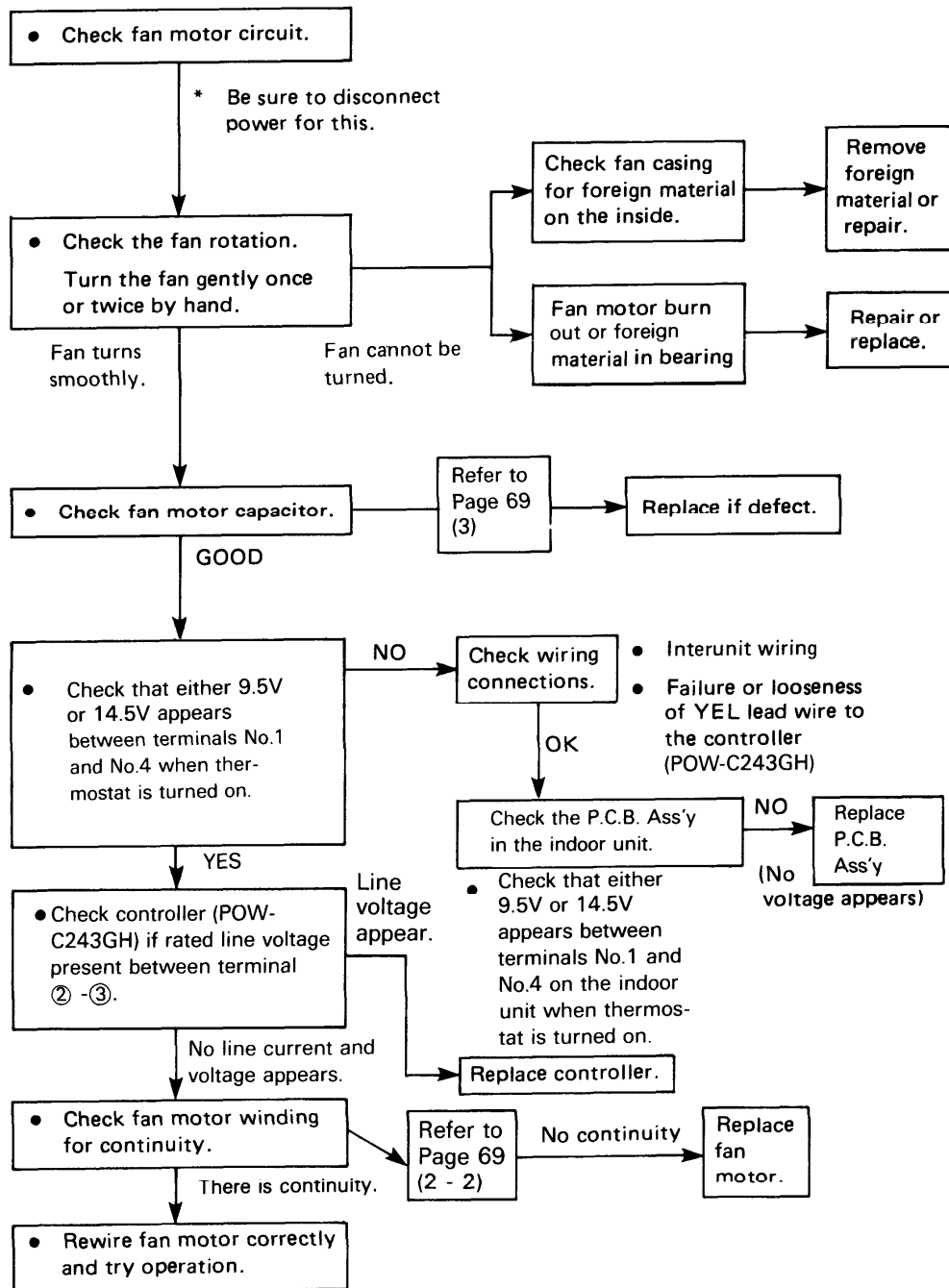
(1) Only indoor fan does not run



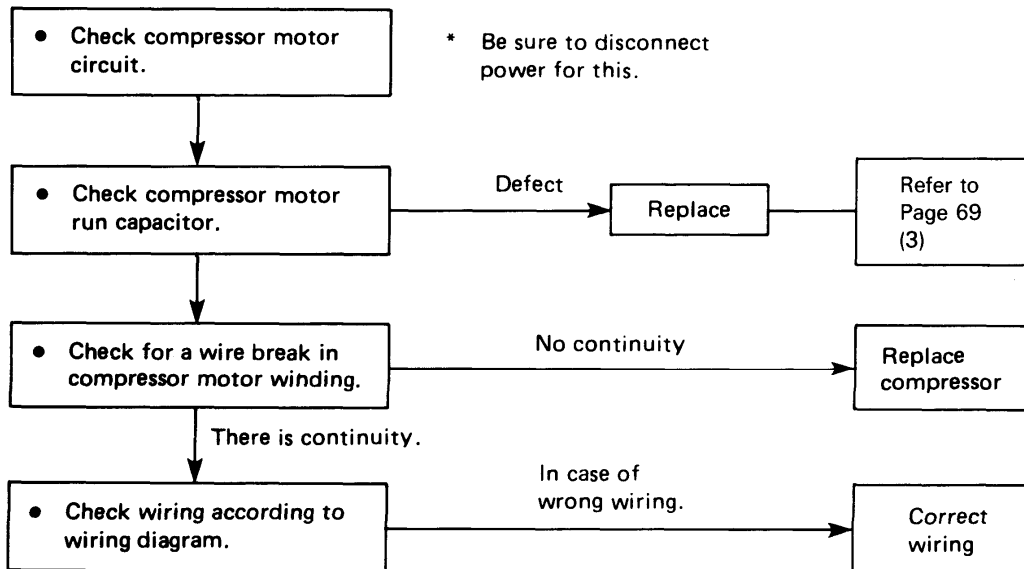
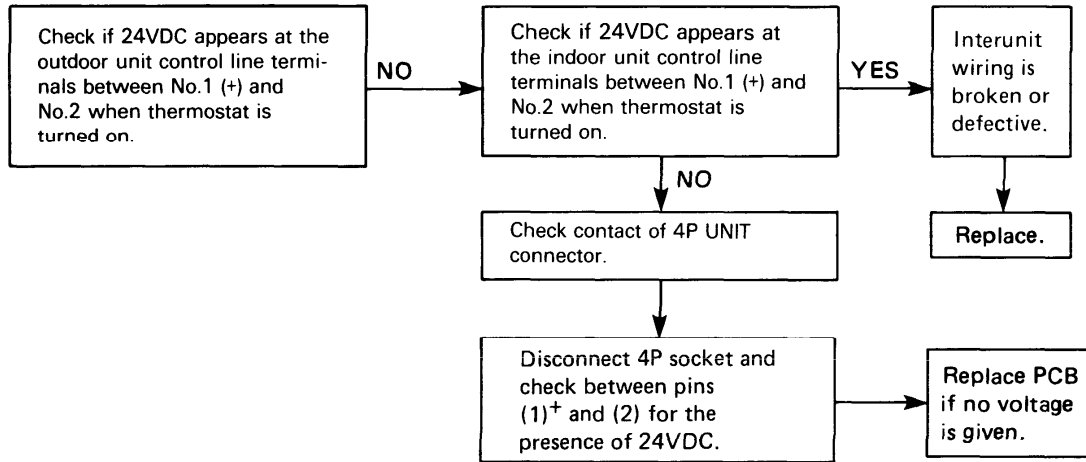
(2) Neither outdoor fan nor compressor runs



(3) Only outdoor fan does not run

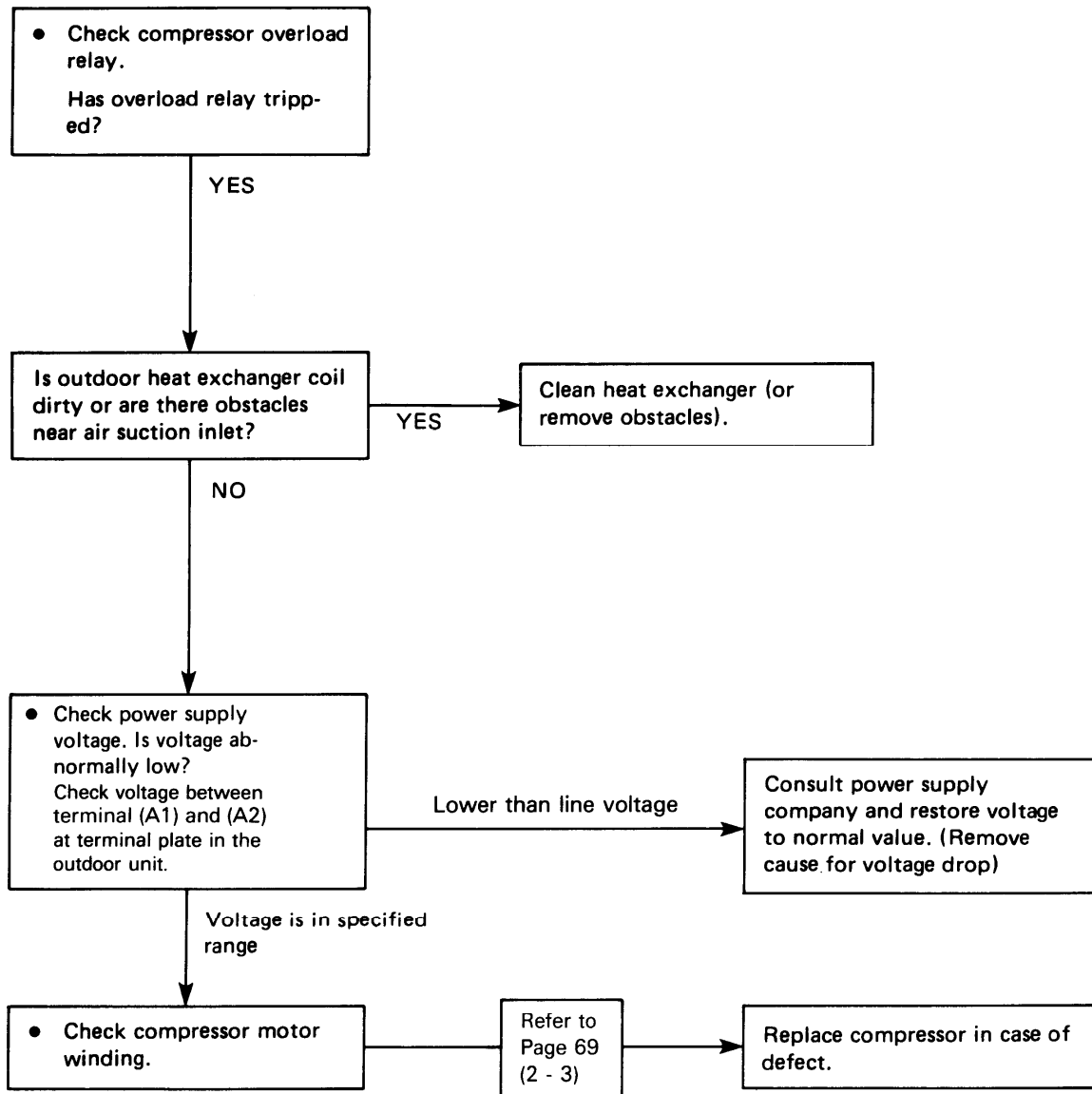


(4) Only compressor does not run



(5) Compressor frequently repeats ON and OFF

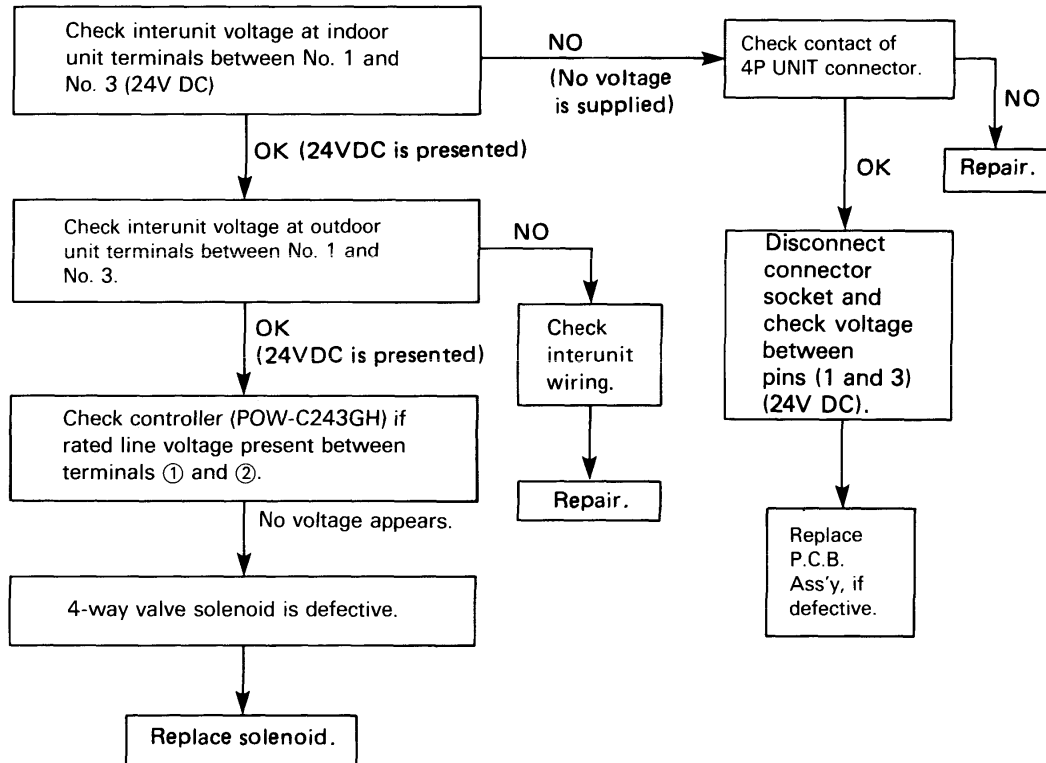
(Only compressor repeats ON and OFF, while indoor unit and outdoor fan runs without fail.)



3. Air conditioner operates, but abnormalities are observed

(1) Heating operation cannot be done.
(only cooling is possible).

1) 4-way valve malfunction



2) Defrosting system malfunction (at heating)

2-1. Defrosting can be achieved after continuous operation of the unit for a long time.

- Remove defrost thermostat from the controller (outdoor unit) terminals ⑤ and ⑥ and check for conductivity.

Defrost thermostat is normal if following conditions will be satisfied:

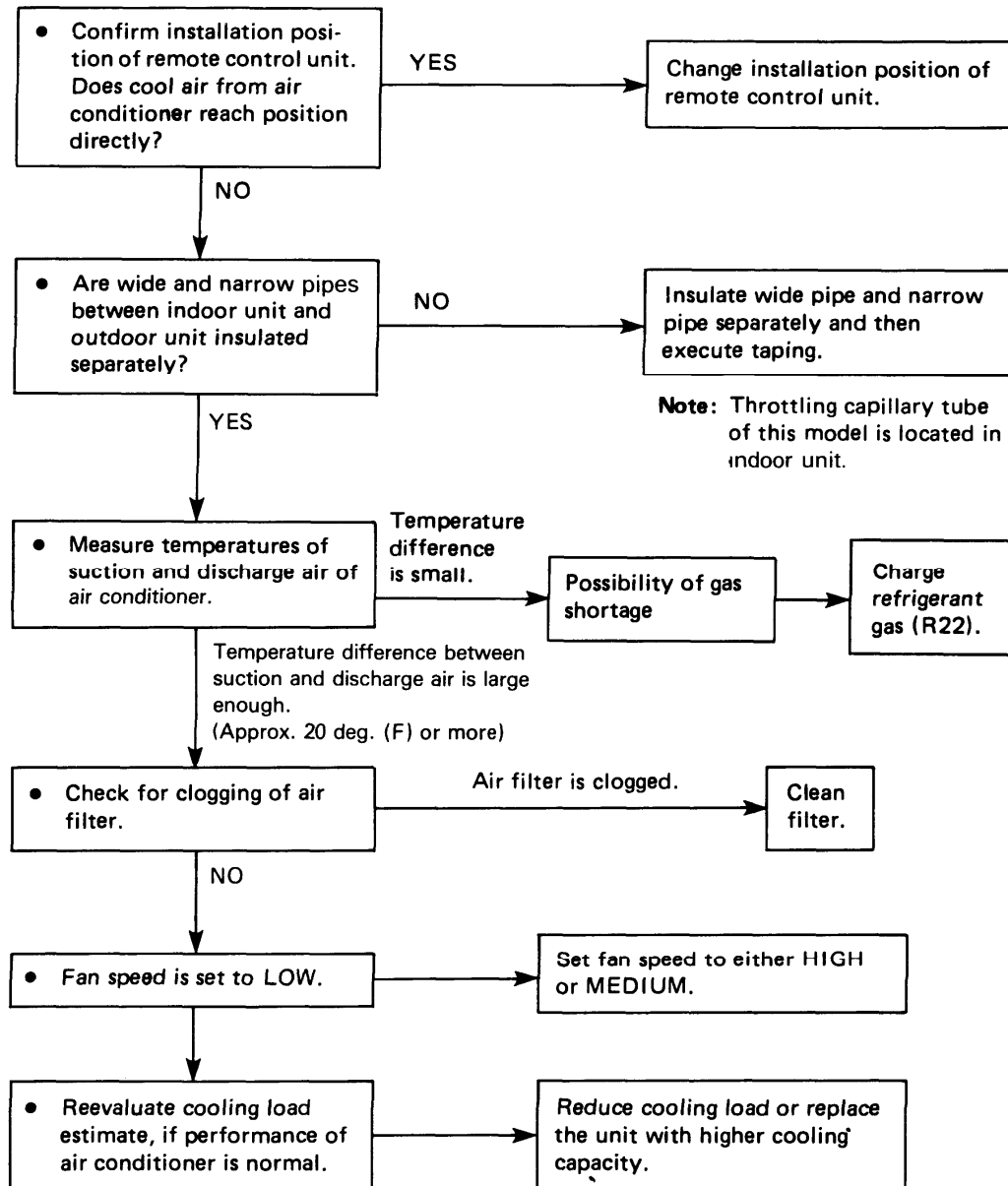
OFF	Maximum 39°F	ON	Minimum 54°F
-----	--------------	----	--------------

If the thermostat stays ON below 39°F, it is defective. —→ Replace the thermostat.

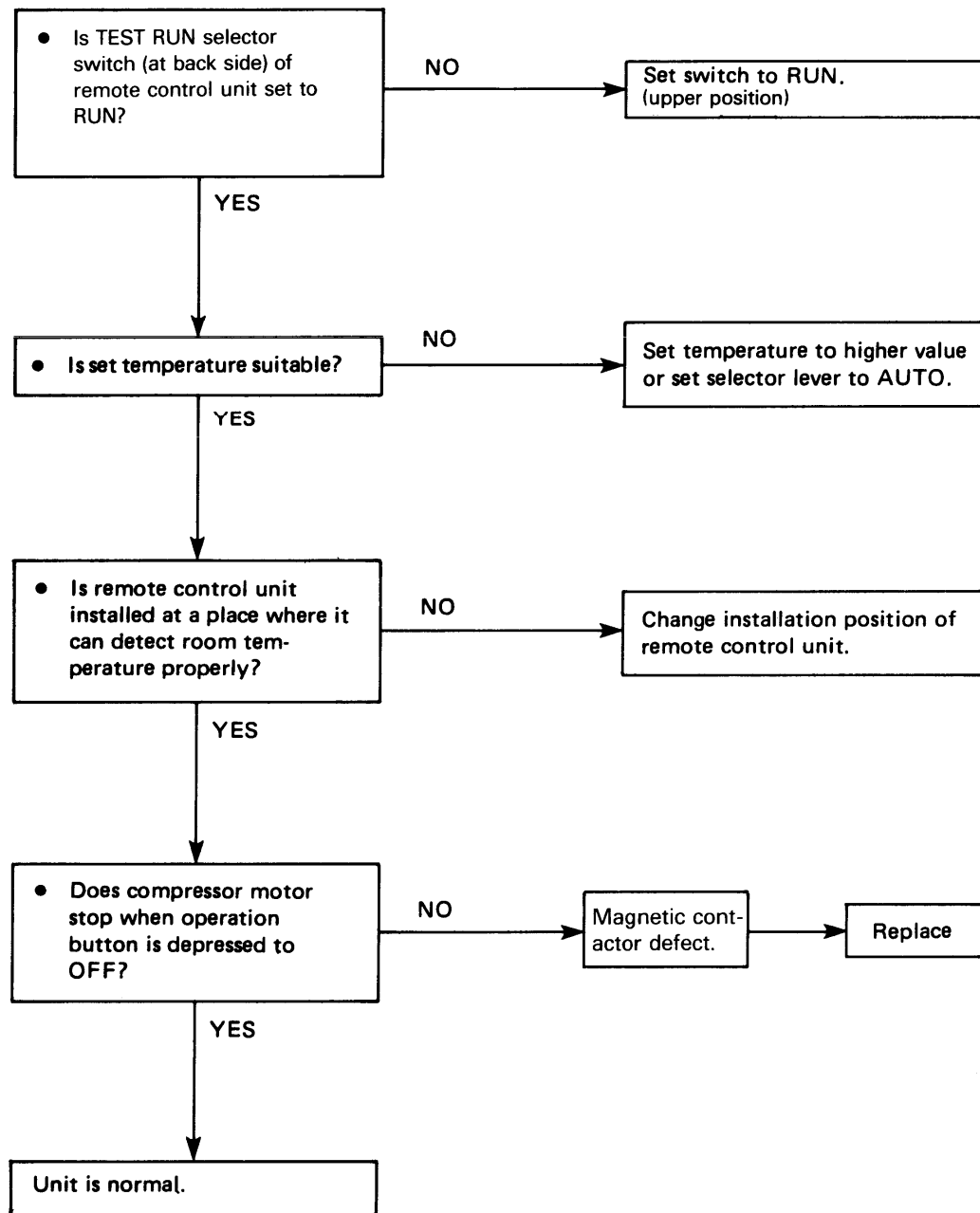
2-2. No defrosting will be taken place at all.

P.C.B. Ass'y (indoor unit) is defective. —→ Replace the P.C.B. Ass'y

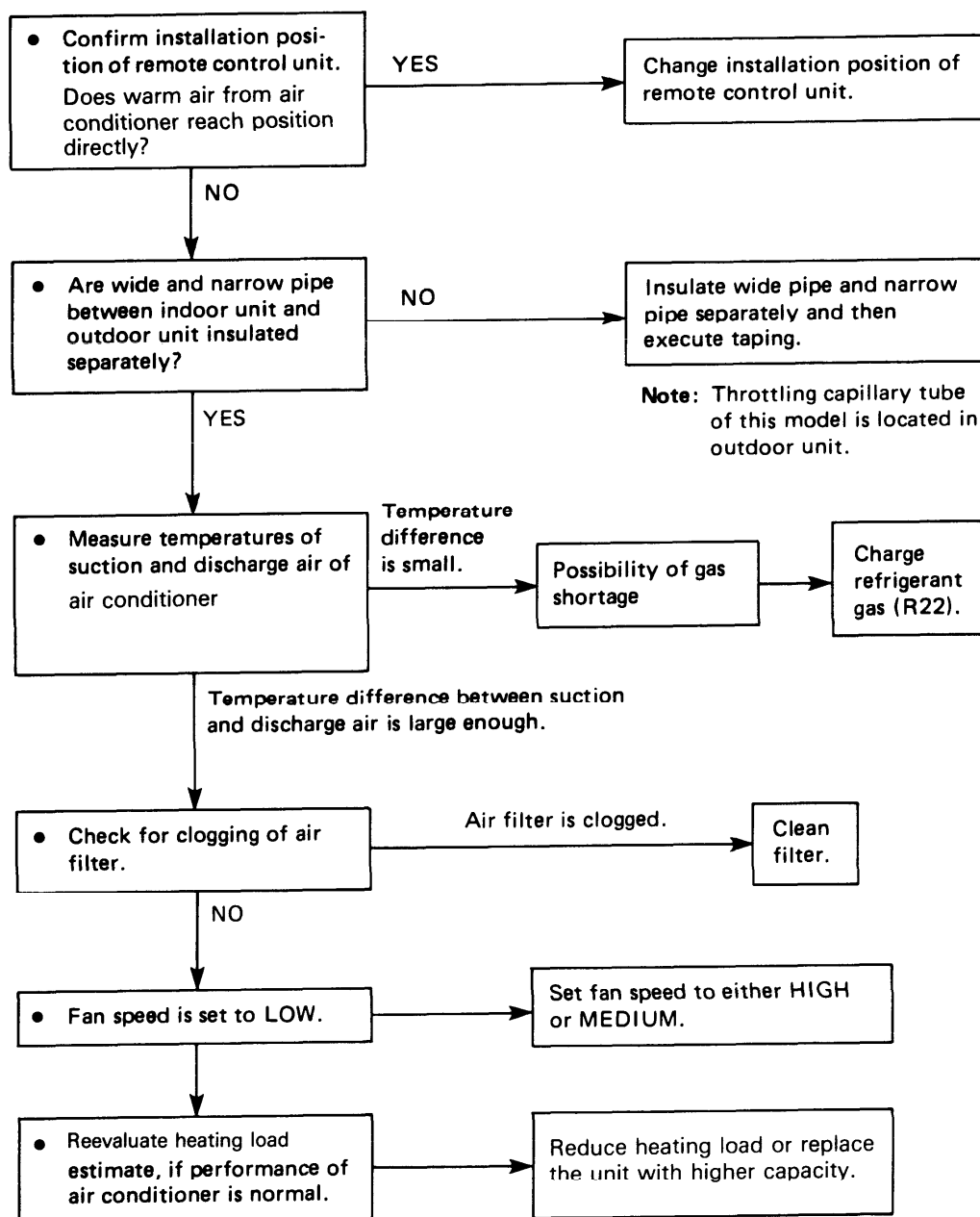
(2) Poor cooling



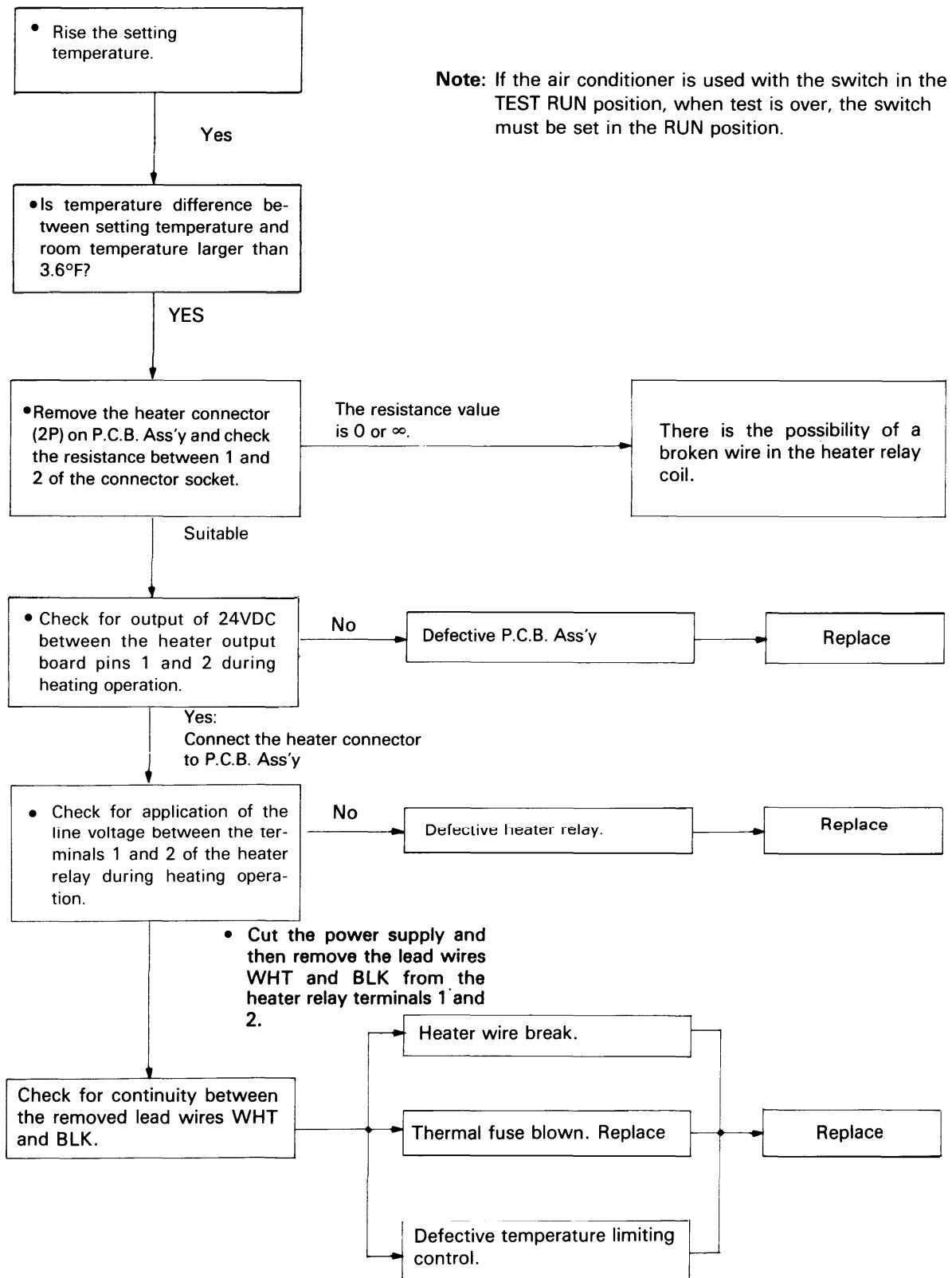
(3) Excessive cooling



(4) Poor heating



(5) The electric heater does not work



14. CHECKING AND REPLACING ELECTRICAL COMPONENTS

— Quick Access Index —

	Page
1. Measurement of Insulation Resistance	68
2. Checkig of the Motor Winding	69
3. Checking of the Motor Capacitor	69
4. Checking of the Relay	70
5. Checking of the Magnetic Contactor	70
6. Chicking of the Thermistor (PTC)	70
7. Checking of the Transformer	71
8. Checking of the Thermostat	71
9. Checking of the 4-way valve	71
10. Checking of the Heater Protector	71
11. Checking of the Remote Control Unit Proper	72
12. Checking of the Continuity of Fuse on the P.C.B. Ass'y	74
13. Checking of the Output of the P.C.B. Ass'y for Fan Motor Terminals	74

1. Measurement of Insulation Resistance

- The insulation is in good condition if the resistance exceeds 1 MΩ

1-1 Power Supply Cords

Clamp the ground line of the Power Supply Cord with a lead clip of the insulation resistance tester and measure the resistance by placing a probe on either of the two power lines.

Then also measure the resistance between the ground line and the other power line. (Fig. 1)

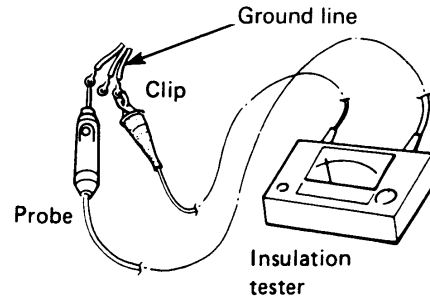


Fig. 1

1-2 Indoor Unit

Clamp the aluminum plate fin or copper tube with a lead clip of the insulation resistance tester and measure the resistance by placing a probe on ⑤, and then ⑥ on the terminal plate. (Fig. 2)

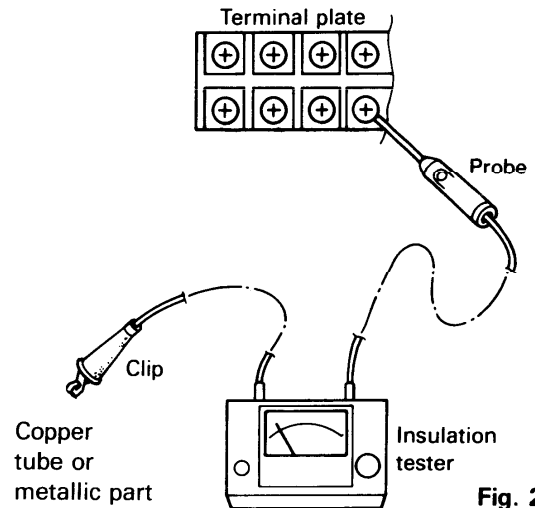


Fig. 2

1-3 Outdoor Unit

Clamp the metallic part of the unit with a lead clip of the insulation resistance tester and measure the resistance by placing a probe on ⑤, and then ⑥ on the terminal plate. (Fig. 2)

1-4 Measurement of Insulation Resistance for Electric Parts.

Disconnect the lead wires of electric part from terminal plate, P.C.B. Ass'y or capacitor etc. Like remove the connector.

Then measure the insulation resistance by method of Fig. 1~4.

Refer to Electric Wiring Diagram.

Note:

If the probe does not enter the pole because the hole is too narrow then use a probe with a thinner pin.

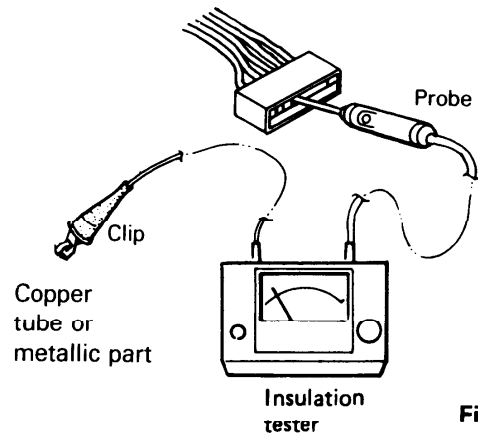


Fig. 3

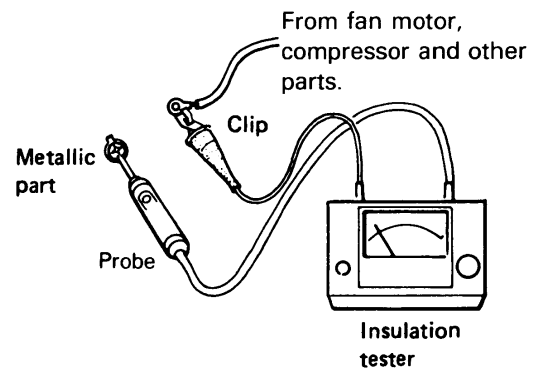


Fig. 4

2. Checking of the Motor Winding

- Refer to Major Component Specifications (Coil resistance)

2-1 Indoor Fan Motor

See page 2

2-2 Outdoor Fan Motor

See page 2

2-3 Compressor Motor

Remove the terminal cover of the compressor motor, set the resistance measuring range of the multimeter to "X1Ω" and check the continuity between each pair out of the 3 terminals as indicated in Fig. 6.

See page 2

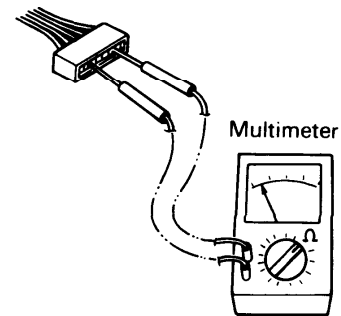


Fig. 5

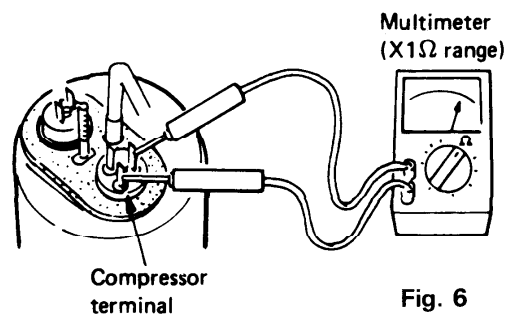


Fig. 6

3. Checking of the Motor Capacitor

Checking of any of the indoor fan motor capacitor, outdoor fan motor capacitor and compressor motor capacitor can be done by the same method.

Remove both the lead wire terminals connected to the capacitor, place the probe on the capacitor terminals as shown in the Fig. 7 and observe the deflection of the pointer, setting the resistance measuring range of the multimeter to the maximum value.

For good condition of the capacitor the pointer bounces to a great extent and then gradually returns to its original position.

The range of deflection and deflection time differ according to the capacity of the capacitor.

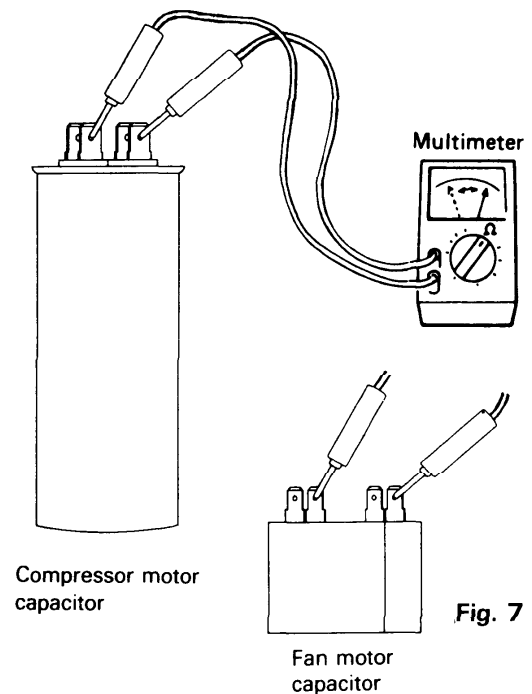


Fig. 7

4. Checking of the Relay

- Refer to Other Component Specifications.
See page 3.

G4E-2123T-US
(Heater relay)

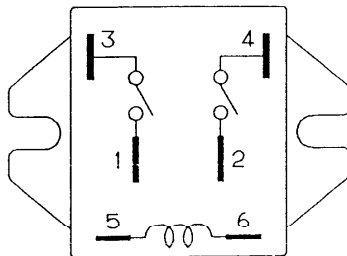


Fig. 8

MY2F-T1-USTS
(Fan motor relay)

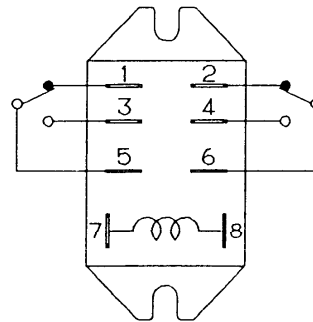
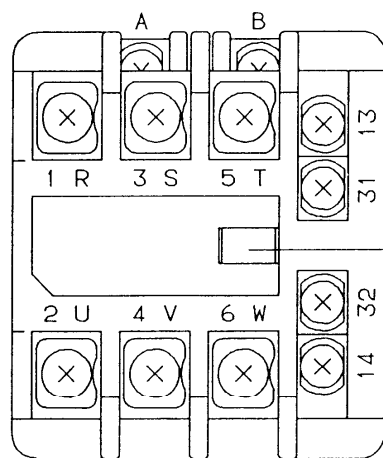


Fig. 9

5. Checking of the Magnetic Contactor.

See page 3.



FMCA-1UL

Push button

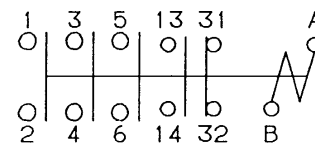
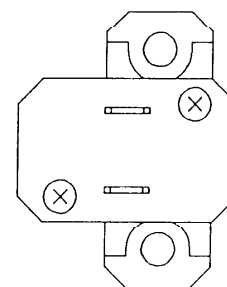


Fig. 10

6. Checking of the Thermistor (PTC)

- Refer to Other Component Specifications.

See page 3.



TDK101YV

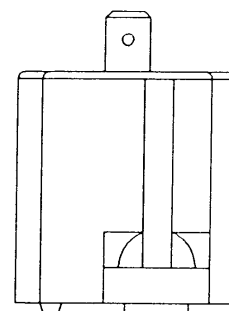


Fig. 11

7 Checking of the Transformer

- Refer to Other Component Specifications.
See page 3.

8. Checking of the Thermostat

- Refer to Other Component Specifications.
See page 4.
- TRS02-12MSR316
Defrost thermostat (Fig. 12)
- YTB-4U305F
Fan speed control thermostat.



Fig. 12

9. Checking of the 4-way valve

- Refer to Other Component Specifications.
See page 4.

10. Checking of the Heater Protector

- Refer to Other Component Specifications.
See page 4.

11. Checking of the Remote Control Unit Proper

(Check each item, referring to the P.C.B. Ass'y and the circuit diagrams)

A. Caution: Use of the Test Switch (RUN/TEST RUN)

"TEST RUN" shows the position to run the air conditioner for the test at the installment.

If this operation is continued for a long time, there would be a bad effect on the air conditioner because of over-cooling. Therefore, use this switch only for checking, and in any case, **DO NOT KEEP ON COOLING FOR MORE THAN 15 MIN. UNDER TEST RUN MODE.**

When the checking is over, **TURN THE SWITCH BACK TO ITS ORIGINAL POSITION (= RUN) WITHOUT FAIL.**

B. Checking of the Items of the Remote Control Unit

At first, pull out the connector (12P) of the remote control unit from the P.C.B. ass'y of the unit.

(1) Checking of the Room Temperature Sensor

Measure the resistance between No. 5 and No. 6 connectors.

NOTE:

If the probe does not enter the pole because the hole is too narrow then use a probe with a thinner pin.

(For an ambient temperature of 77°F the resistance is about 5 kΩ).

(2) Fan Speed Selector

Check the continuity of the connector No. 3 and No. 4 against No. 10 (place the positive (+) probe on No. 10 and negative (-) probe on No. 3 and then No. 4).

Checking points	Position of the selector			
	High	Med.	Low	Auto
10 – 3	NO	YES	YES	NO
10 – 4	YES	YES	NO	NO

NOTE: YES Continuity (Table-1)
NO Discontinuity

(3) Checking of the Operation

Measure the continuity between No. 11, 12 and No. 9 (placing the positive (+) probe).

Checking points	Position of the selector			
	Fan	Cool	Heat	Auto
9 – 11	NO	NO	YES	YES
9 – 12	NO	YES	YES	NO

(Table-2)

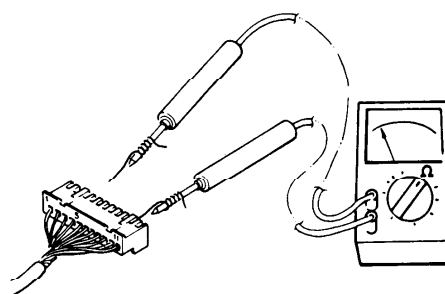


Fig. 13

NOTE: YES Continuity
NO Discontinuity

(4) Checking of the Selector

Check the continuity of the connectors No. 1, 2 and 3 (placing the negative (-) probe) against No. 9 (placing the positive (+) probe).

Connector No.	Position of the Selector				
	MANUAL	ENERGY SAVER	NIGHT SETBACK	TIMER	
				ON	OFF
9 — 3	NO	NO	NO	YES	NO
9 — 1	NO	NO	YES	YES	YES
9 — 2	NO	YES	YES	NO	NO

NOTE
YES Continuity
NO Discontinuity

(Table-3)

(5) Checking of the Operation Button

The operating switch is in good working condition if there is continuity between No.4 (placing the negative (-) probe) and No.9 (placing positive (+) probe) while the pushbutton is pressed.

(6) Checking of the Timer

Measure the continuity between No. 4, 3, 1, 2 and No. 8 (placing the positive (+) probe).

Connector No.	Position of the Selector											
	1	2	3	4	5	6	7	8	9	10	11	12
8 — 4	—	—	—	—	—	—	—	—	Y	Y	Y	Y
8 — 3	—	—	—	—	Y	Y	Y	Y	Y	Y	Y	Y
8 — 1	—	—	Y	Y	Y	Y	—	—	—	—	Y	Y
8 — 2	—	Y	Y	—	—	Y	Y	—	—	Y	Y	—

Y for YES = There is continuity.

(Table-4)

(7) Checking of the Thermostat

Measure the continuity between No. 4, 3, 1, 2 and No. 7 (placing the positive (+) probe).

Connector No.	Position of the Selector										
	63	65	67	69	71	73	75	77	79	81	83
7 — 4	—	—	—	—	—	Y	Y	Y	Y	Y	Y
7 — 3	—	Y	Y	Y	Y	Y	Y	Y	Y	—	—
7 — 1	Y	Y	Y	—	—	—	—	Y	Y	Y	Y
7 — 2	—	—	Y	Y	—	—	Y	Y	—	—	Y

Y for YES = There is continuity.

(Table-5)

If there is abnormality during checking at any of the above step from (1) to (7), replace the remote control unit as it is.

CAUTION:

Do not disassemble the Remote Control Unit.

It is supplied as a complete assembly and is carefully adjusted in the factory by skillful workmanship. Inexperienced disassembly will cause trouble and malfunction in the unit.

12. Checking of the Continuity of Fuse on the P.C.B. Ass'y

Check the continuity by the multimeter as shown in Fig. 14.

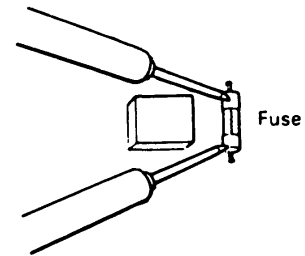


Fig. 14

NOTE

Method to Replace Fuse on the P.C.B. Ass'y

1. Remove the P.C.B. ass'y.
2. Pull out the fuse at the metal clasp by a pair of pliers while heating the soldered leads on the back side of the P.C.B. ass'y with a soldering iron (30W or 60W). Fig. 15.
3. Remove the fuse ends one by one. For replacement, insert a fuse of the same rating and solder it.
(Allow time to radiate heat during soldering so that the fuse does not melt).

CAUTION

: Be sure to replace the varistor adjacent to the fuse when the fuse is blown.

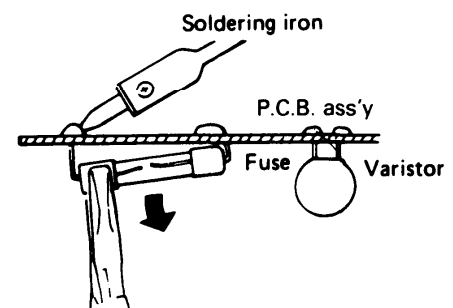


Fig. 15

13. Checking of the Output of the P.C.B. Ass'y for Fan Motor Terminals

Take out the fan motor connector from P.C.B. Ass'y and be sure that there is no danger of short circuit in other parts before supplying electricity to the unit. After that, supply electricity to the unit and set the selector to "MANUAL". Then, turn on the operation switch.

Now measure the voltage between these pins by the multimeter. The P.C.B. Ass'y is in good working condition if the voltage output becomes same as those shown in the below tables.

Pair of Pins	FAN		
	Low	Med.	High
1 — 4	*	0	0
1 — 2	0	*	0
1 — 3	0	0	*

* Line voltage

(Table-6)

15. DISASSEMBLY PROCEDURES

— Quick Access Index —

Page

INDOOR UNIT

1. Casing — Removal	76
2. Electrical Component Box	76
— Access and Removal —	
3. Evaporator (= Indoor Heat Exchanger) — Removal	77
4. Fan and Fan Motor — Removal	77
5. Heater Thermal Protector — Removal	78
6. Electric Heater — Removal	78

OUTDOOR UNIT

7. Casing — Removal	79
8. Fan and Fan Motor — Removal	79
9. Electrical Component Box — Removal	80
10. Compressor Cover — Removal	80
11. Compressor — Removal	81

INDOOR UNIT

1. Casing — Removal

- 1) Remove three screws holding the casing to the indoor unit.
- 2) Pull up the casing by hand, press down on tabs on top, then withdraw the casing by pulling it back straight. Fig. 1.

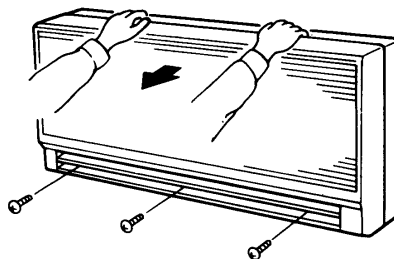


Fig. 1

2. Electrical Component Box — Access and Removal

- 1) Remove casing.

CAUTION : Before accessing inside the electrical component box, be sure to check that power to the unit is disconnected.

- 2) Remove the cover plates (A) and (B) by unfastening a screw.
- 3) Disconnect the interunit wires from the terminal plate.
- 4) Remove or loosen the connector socket and lead wires in accordance with Fig. 2.

CAUTION :

Do not apply an excessive force when removing the connector socket or lead wires.

- 5) Unfasten the screws in accordance with Fig. 2. The electrical component box can be pulled out.

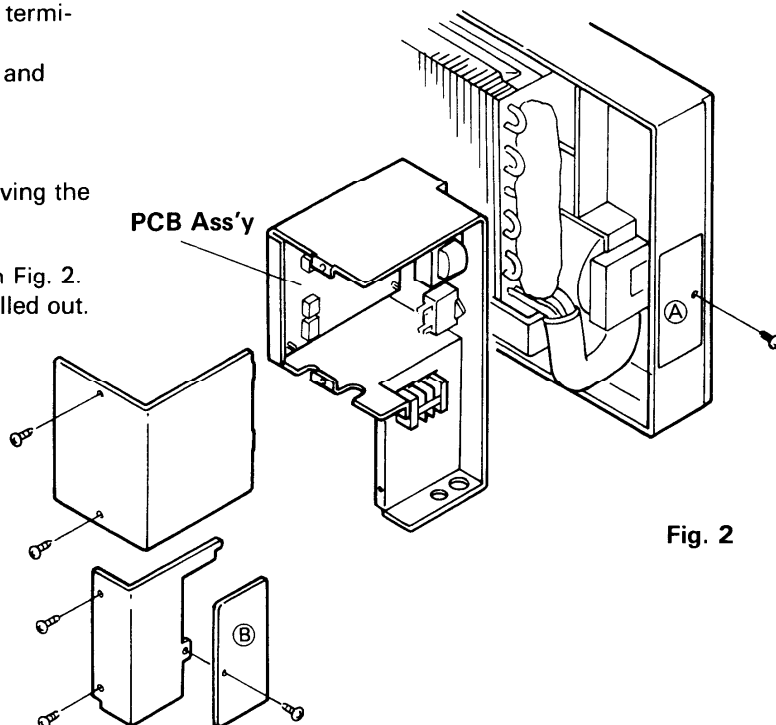


Fig. 2

3. Evaporator (Indoor Heat Exchanger) and Drain Pan — Removal

- 1) Remove the electrical component box.
- 2) Remove the refrigerant piping holder (A).
- 3) The drain pan can be pulled out after removing the screws shown in Fig. 3.
- 4) Loosen the fixing screws of the evaporator mounting plates (B) and (C), and remove them respectively.
- 5) Lift up the evaporator with both hand, then withdraw the evaporator together with the piping.

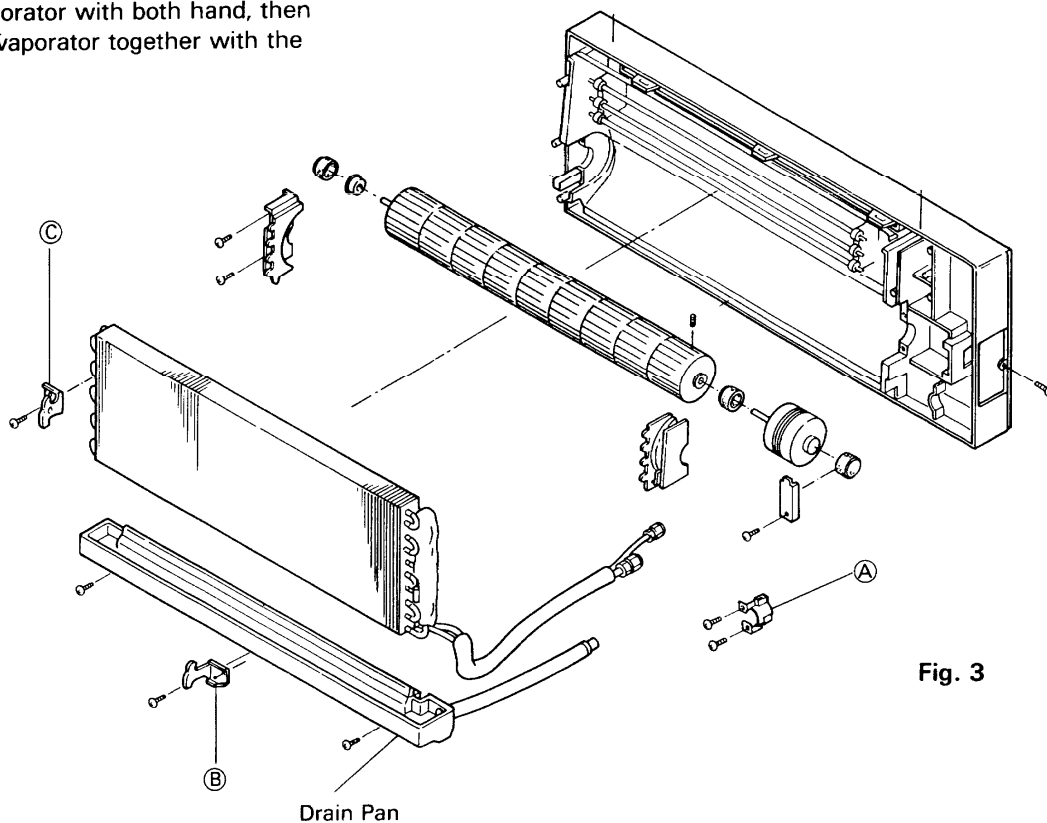


Fig. 3

4. Fan and Fan Motor — Removal

- 1) As shown in Fig. 4 loosen the screws of the plastic mounting plates (A), (B) and (C) which secure the fan, then remove the fan and fan motor.
- 2) When withdrawing the fan from the motor, first loosen the fan fixing bolts using a hexagonal key.
- 3) Withdraw the Bearing Ass'y (D) retaining the left side of the fan, by hand, then pull the fan to the left and withdraw it from the motor shaft.

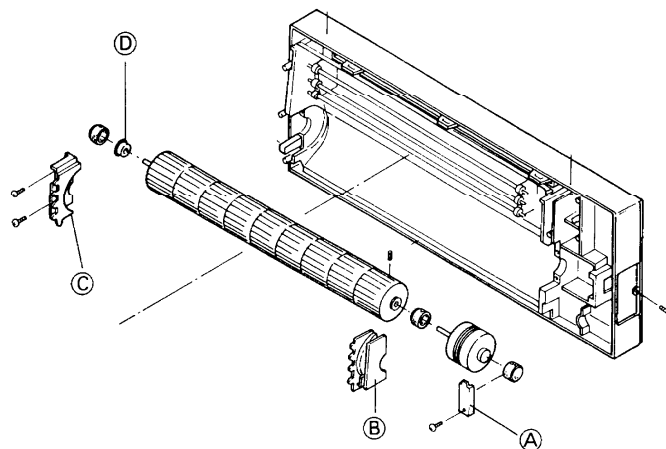


Fig. 4

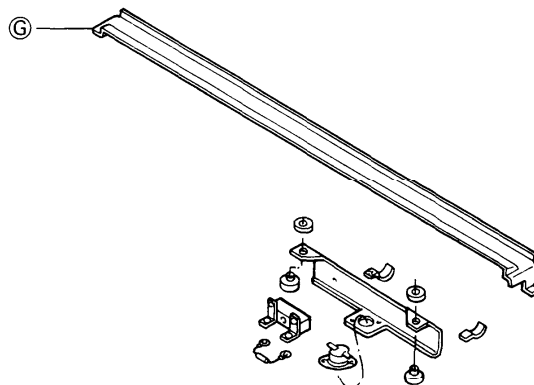
5. Heater thermal protector — Removal :

- 1) Alternately remove the left and right claws of the upper plate (G) of the evaporator. (When the evaporator is in place, the upper plate (G) of the evaporator can be removed more easily by loosening the screws of the evaporator mounting plate and creating extra space above the evaporator.)

Note:

At the time of reinstallation, confirm that the claws securely engage the catches.

- 2) Remove the thermostat mounting plate after removing the screws at the right and the left. Fig. 5.



6. Electric Heater — Removal

- 1) Remove the evaporator.
- 2) Remove the wiring connection screws on both sides of the heater (F).
- 3) Remove the screws of the heater mounting plate (E), and separate the installation fittings from the heater. Fig. 5.

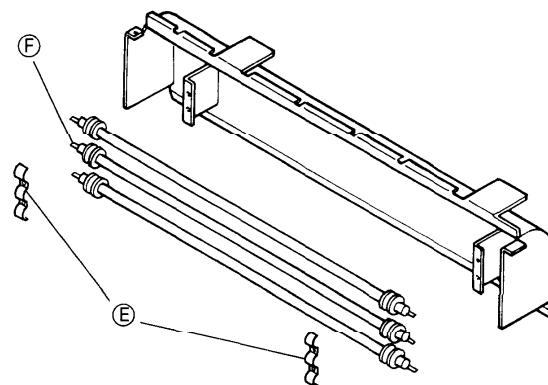


Fig. 5

OUTDOOR UNIT

7. Casing—Removal

- 1) Remove the exterior panels in the order of the front panel (A), side panel (B) and side panel (C).
- 2) Remove the cover plates (D) and (E).
- 3) Remove the mounting plate (F). Fig. 6

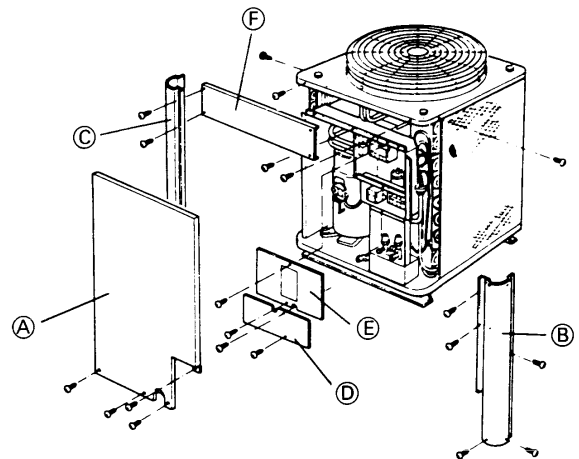


Fig. 6

8. Fan and Fan Motor—Removal

- 1) Remove the fan (B) and fan motor (D) by lifting up after removing the guard (A) and loosening one screw (a) of the fan.
- 2) Disconnect the fan motor wires (E) from the electrical component box (F) and then, remove the top cover (C) with fan motor Fig. 7

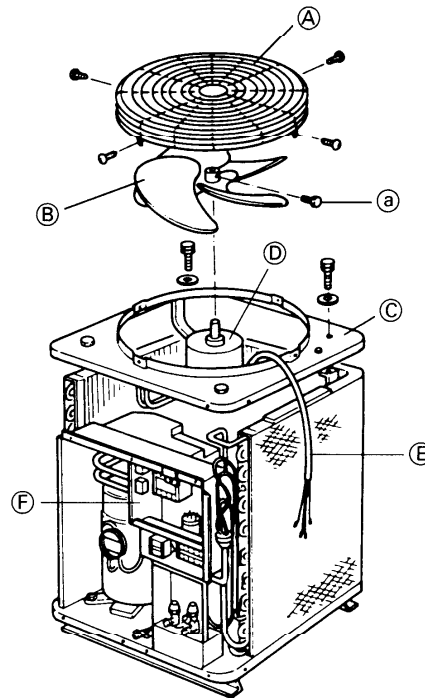


Fig. 7

9. Electrical Component Box—Removal

1) Disconnect the following wires from the electrical component box.

- ① Compressor wire
- ② Crankcase heater wire
- ③ 4-way valve wire
- ④ Pressure switch wire

2)

- ① Remove the cover plate **A**.
- ② Remove insulation **B**. Loosen and remove the sensor **C**.

3) The electrical component box can now be removed by unscrewing one screw **D**. Fig. 8

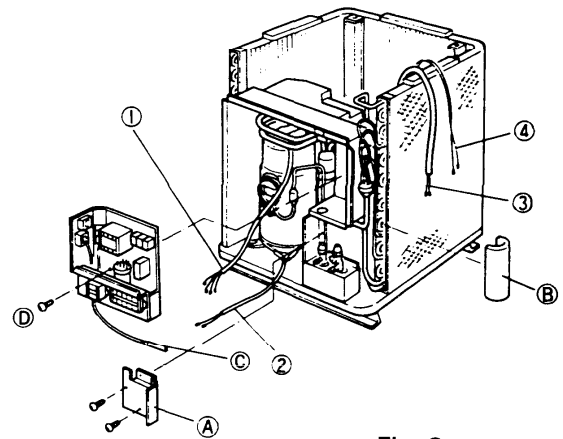


Fig. 8

10. Compressor Cover—Removal

1) Unfasten four screws fixing the cover **A**. The cover can be removed by lifting it upward. Fig. 9

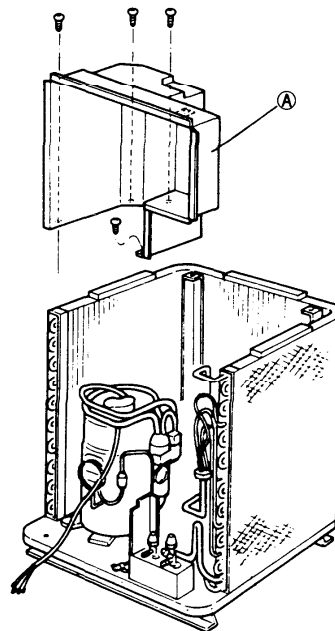


Fig. 9

11. Compressor-Removal

Take apart three joints ①, ② and ③ brazed to the compressor by brazing torch (Fig. 10).

CAUTION

- 1) Many wires have to be removed. When removing wires, carefully check the electric diagram on the rear side of the cover plate ④ Fig. 6. Reconnect the wires correctly after replacing the compressor.
- 2) Three sections of the replacement compressor ① ② and ③ are sealed to avoid entry of dust and water. Remove this seals, then connect to the unit piping when replacing the compressor Fig. 11.

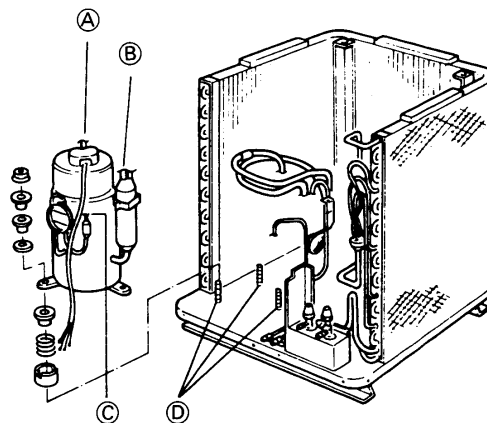


Fig. 10

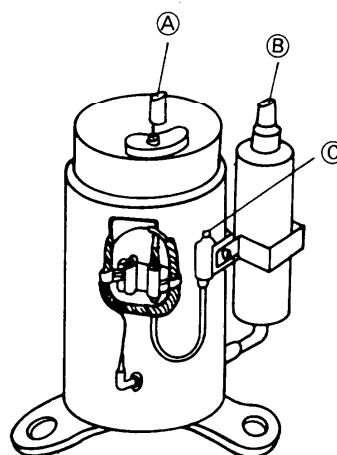
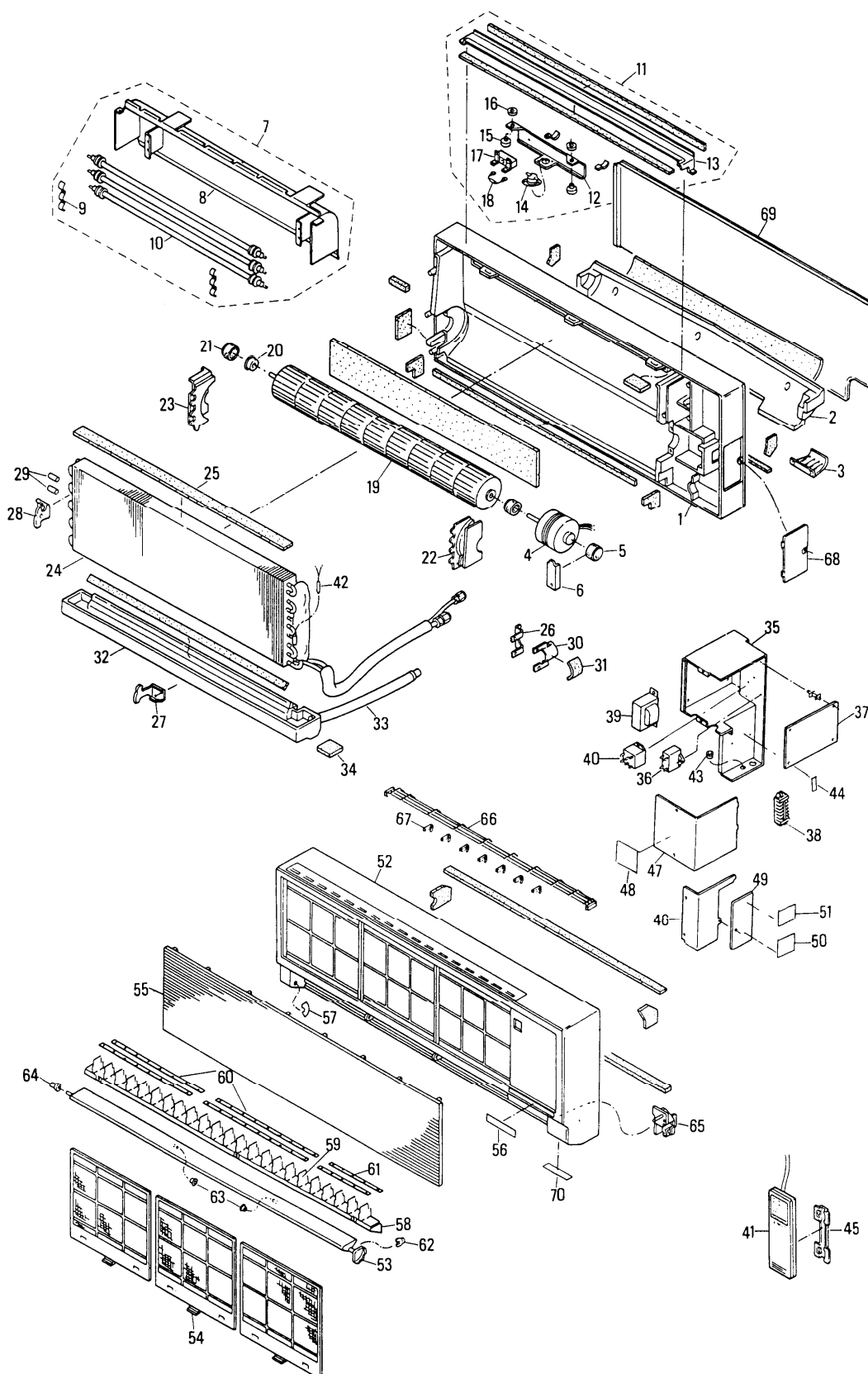


Fig. 11

16. PARTS LIST



ATTENTION !

To ensure correct parts supply, please let us know followings,
when you make service parts order:

1. Part No. 2. Description 3. Q'ty 4. Volts-Hz-Ph 5. Product Model No.

Key No.	Part No.	Description	Q'ty
1	623 096 9384	Frame Ass'y (incl. No. 2, 3)	1
2	623 096 8608	Insulation, Rear Cover	1
3	623 050 5995	Mounting Plate	2
4	623 096 4945	Fan Motor Ass'y KFH4Q-31A6P	1
5	623 092 9463	Cushion Rubber	2
6	623 096 4600	Mounting Plate, Fan Motor	1
7	623 096 4952	Heater Ass'y AH-KH2412 (incl. No. 8-18)	1
8	623 096 8516	Cover Ass'y	1
9	623 050 5698	Mounting Plate	2
10	623 096 4969	Heater 230V 600W	3
11	623 096 4976	Protector Ass'y (incl. No. 12-18)	1
12	623 050 5674	Mounting Plate	1
13	623 096 4983	Partition Plate Ass'y	1
14	623 002 9668	Thermostat	1
15	623 008 5602	Insulation	2
16	623 008 5619	Insulation	2
17	623 096 8523	Holder, Thermo Fuse	1
18	623 030 8374	Fuse Ass'y SF188U	1
19	623 092 9487	Cross-Flow Fan Ass'y	1
20	623 042 0069	Bearing Housing Ass'y	1
21	623 053 2182	Cushion Rubber, Fan Motor	1
22	623 096 4617	Cover Plate	1
23	623 096 4624	Cover Plate	1
24	623 096 5003	Evaporator Ass'y	1
25	623 096 8950	Insulation, Evaporator	1
26	623 092 9531	Mounting Plate	1
27	623 050 5636	Mounting Plate	1
28	623 050 5704	Mounting Plate	1
29	623 096 8967	Sleeve	2
30	623 092 9548	Mounting Plate	1
31	623 096 8974	Packing	1
32	623 096 4662	Drain Pan Ass'y	1
33	623 096 3931	Drain Pipe Ass'y	1
34	623 096 8981	Packing	1
35	623 096 4679	Elec. Component Box Ass'y	1
36	623 001 2066	Fixed Capacitor 440V 1.8MFD	1
37	623 096 3023	P. C. B. Ass'y POW-K243GH5	1
38	623 096 5041	Terminal Base JTU20-6	1
39	623 096 5058	Transformer Ass'y ATR-J122U	1
40	623 002 4397	Relay C4E-2123T-US	1
41	623 096 5065	Remote Control Unit RCS-KH2412W	1
42	623 096 5089	Thermistor Ass'y PTC-51H-S3	1
43	623 038 3395	Bushing	1
44	623 060 3561	Label	1
45	623 038 4095	Mounting Plate	1
46	623 096 4754	Cover Plate Ass'y	1
47	623 096 4723	Cover Plate	1
48	623 096 5096	Elec. Wiring Diagram	1
49	623 096 5102	Cover Terminal Ass'y (incl. No. 50, 51)	1
50	623 084 8269	Label	1

NOTE: Metal and plastic parts will be supplied basically
with necessary heat insulation pads or packing.

ATTENTION !









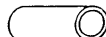

To ensure correct parts supply, please let us know followings,
when you make service parts order:

1. Part No. 2. Description 3. Q'ty 4. Volts-Hz-Ph 5. Product Model No.

Key No.	Part No.	Description	Q'ty
51	623 096 5300	Label	1
52	623 096 6057	Grille Ass'y (incl.No. 53-67)	1
53	623 096 8615	Flap	1
54	623 096 6871	Air Filter Ass'y	3
55	623 096 8622	Ornamental Plate	1
56	623 096 3122	Badge	1
57	623 096 3061	Label	1
58	623 096 4761	Ornamental Plate Ass'y (incl.No. 59-61)	1
59	623 096 8639	Blade Air Guid	23
60	623 096 8646	Fastener Blade	4
61	623 096 8653	Fastener Blade	2
62	623 092 9647	Fastener Blade	1
63	623 049 1502	Mounting	2
64	623 049 1472	Mounting	1
65	623 096 4778	Mounting Plate, Blade	1
66	623 096 4785	Guard Ass'y	1
67	623 096 4792	Mounting Plate	7
68	623 096 4808	Cover Plate	1
69	623 092 9685	Hook Plate	1
70	623 096 5119	Name Plate	1
•	623 096 9391	Installation Instructions	1
•	623 096 6932	Operation Manual	1

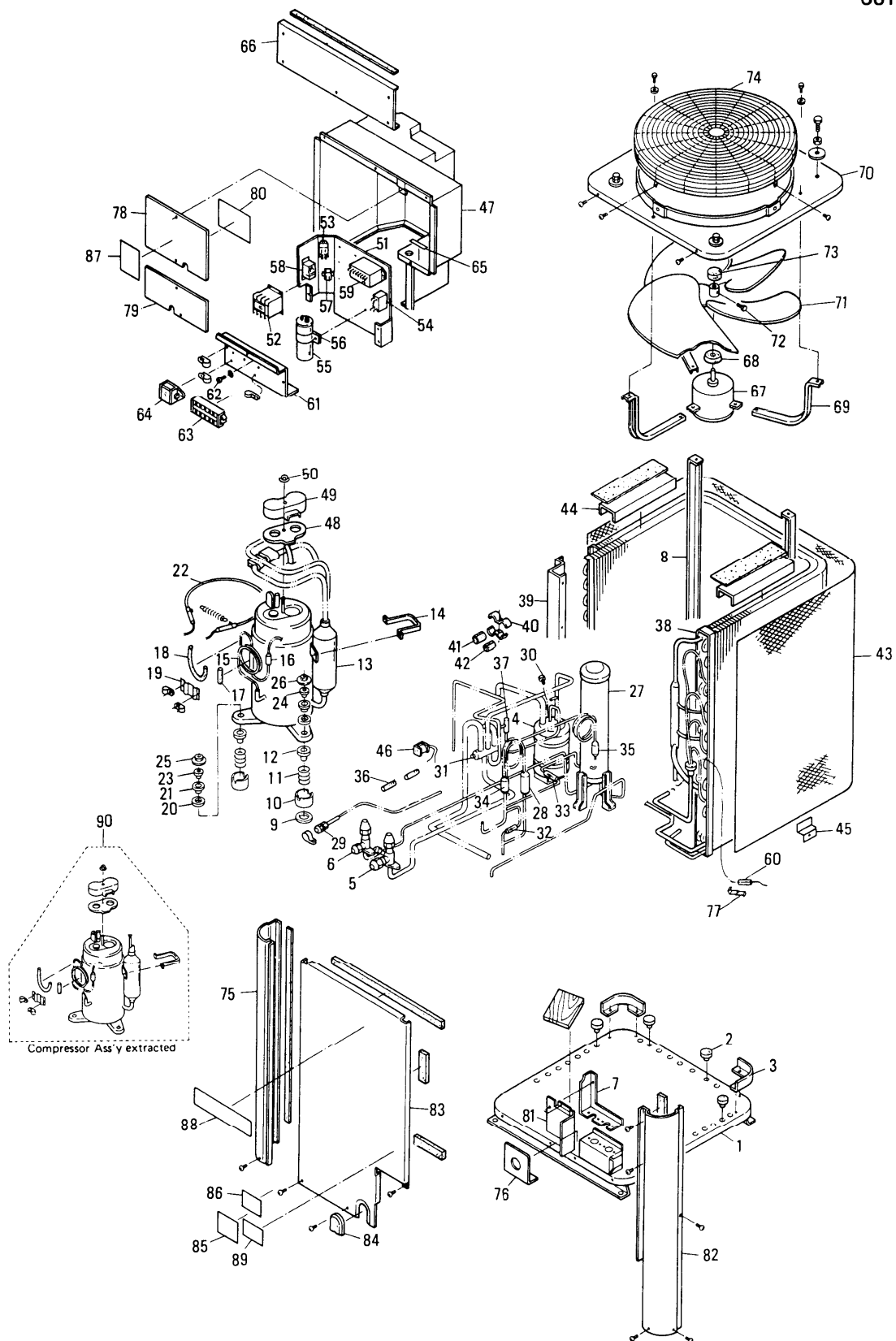
NOTE: Metal and plastic parts will be supplied basically
with necessary heat insulation pads or packing.

■ Accessories Supplied with Unit for Installation

No.	Parts Name	Figure	Q'ty	No.	Parts Name	Figure	Q'ty	
1	Rear Panel		1	6	For Control Unit	Mounting Plate		1
2	Rawl Plug		10	7		Screw	 TOTA 4 × 12 mm	2
3	Cover		1	8		Code Clip		2
4	Screw	 TOTA 4 × 16 mm	10	9		Screw	 SATA 3 × 10 mm	2
5	Drain Hose Adaptor		1	10	Insulator			1

Key No.	Part No.	Description	Q'ty
1	623 092 9685	Rear Panel	1
2	623 045 3685	Rawl Plug	10
3	623 051 5468	Cover	1
4	623 090 8185	Screw TOTA 4X16	10
5	623 077 4391	Drain Hose Adaptor	1
6	623 038 4095	Mounting Plate	1
7	623 093 1473	Screw TOTA 4X12	2
8	623 038 2558	Cord Clip	2
9	623 093 0209	Screw SATA 3X10	2
10	623 052 8031	Insulation	1

CH2412 OUTDOOR UNIT



ATTENTION !

To ensure correct parts supply, please let us know followings,
when you make service parts order:

1. Part No. 2. Description 3. Q'ty 4. Volts-Hz-Ph 5. Product Model No.

Key No.	Part No.	Description	Q'ty
1	623 067 4295	Bottom Plate Ass'y	1
2	623 073 3831	Sheet Rubber	4
3	623 078 5205	Mounting Plate	2
4	623 070 8532	Accumulator Ass'y	1
5	623 070 6163	Valve Ass'y 5/8 in.	1
6	623 070 9263	Valve Ass'y 1/4 in.	1
7	623 072 2798	Cover Plate	1
8	623 067 4936	Frame Ass'y	2
9	623 000 0209	Washer	1
10	623 035 0144	Cushion Rubber	3
11	623 034 5836	Spring	3
12	623 078 4819	Protection Rubber	3
13	623 070 8488	Accumulator Ass'y	1
14	623 034 9452	Band Mounting	1
15	623 096 9018	Capillary Tube	1
16	623 043 4059	Strainer Ass'y	1
17	623 051 0128	Packing	1
18	623 065 2422	Mounting Rubber, Capillary	1
19	623 050 5742	Mounting Plate	1
20	623 078 4826	Protection Rubber	3
21	623 078 4376	Spacer	3
22	623 096 5133	Heater Ass'y CH5700 230V 30W	1
23	623 078 4802	Protection Rubber	2
24	623 078 4833	Protection Rubber	1
25	623 068 1125	Nut Special Ass'y	2
26	623 029 6558	Nut Special Ass'y	1
27	623 069 0813	Receiver Tank Ass'y	1
28	623 043 3588	Dehydrater Ass'y	1
29	623 070 7429	Charge Port Ass'y	1
30	623 081 4554	Fusible Plug	1
31	623 004 1752	Solenoid V26-9000	1
32	623 070 8839	Check Valve Ass'y	1
33	623 070 8662	Check Valve Ass'y	1
34	623 043 4028	Strainer Ass'y	1
35	623 043 3984	Strainer Ass'y	1
36	623 081 4622	Mounting Rubber, Capillary	2
37	623 043 0990	Discharge Pres. Regulator Ass'y	1
38	623 096 5164	Evaporator Ass'y (incl.No.39)	1
39	623 080 3206	Mounting Plate	2
40	623 081 5940	Mounting Plate, Tube	2
41	623 081 5834	Mounting Rubber, Tube	1
42	623 081 5605	Mounting Rubber, Tube	1
43	623 071 9910	Guard	1
44	623 078 5182	Mounting Plate Ass'y	2
45	623 078 5281	Mounting Plate	3
46	623 096 5201	Solenoid Ass'y L27-9072	1
47	623 068 2788	Cover Ass'y	1
48	626 040 0338	Gasket Terminal	1
49	626 040 0673	Cover Terminal	1
50	626 040 0956	Nut, Compressor	1

NOTE: Metal and plastic parts will be supplied basically
with necessary heat insulation pads or packing.

ATTENTION !

To ensure correct parts supply, please let us know followings,
when you make service parts order:

1. Part No. 2. Description 3. Q'ty 4. Volts-Hz-Ph 5. Product Model No.

Key No.	Part No.	Description	Q'ty
51	623 071 0733	Elec. Component Box Ass'y	1
52	623 096 4884	Relay FMCA-1UL	1
53	623 002 4809	Relay MY2F-T1-USTS	1
54	623 001 1878	Fixed Capacitor 440V 5MFD	1
55	623 001 2530	Fixed Capacitor 400V 35MFD	1
56	623 054 7964	Clip, Capacitor	1
57	626 100 0049	Thermistor TDK 101YV	1
58	623 096 5218	Thermostat YTB-4U305F	1
59	623 096 3825	P.C.B. Ass'y POW-C243CH5	1
60	623 096 5256	Thermostat Ass'y TRS02-12MSR316	1
61	623 071 0962	Elec. Component Box Ass'y	1
62	623 051 6977	Screw Special	1
63	623 003 3047	Terminal Base JTU20-6	1
64	623 003 3108	Terminal Base KTU60-2J	1
65	623 060 3561	Label	1
66	623 076 7928	Mounting Plate Ass'y	1
67	623 096 5287	Fan Motor Ass'y KFC0S-101AGP	1
68	623 053 2465	Cover Rubber	1
69	623 068 6410	Support Motor Ass'y	3
70	623 066 5682	Top Cover Ass'y	1
71	623 068 3631	Propeller Fan Ass'y (incl.No.72)	1
72	623 079 9431	Set Screw, Blower	1
73	623 078 3935	Cap	1
74	623 066 8997	Guard Ass'y	1
75	623 066 2612	Side Panel Ass'y	1
76	623 078 6011	Mounting Plate	1
77	623 054 8435	Mounting Thermostat	1
78	623 081 9788	Cover Plate	1
79	623 081 9795	Cover Plate	1
80	623 096 5294	Elec. Wiring Diagram	1
81	623 072 3030	Cover Plate	1
82	623 066 2629	Side Panel Ass'y	1
83	623 066 1370	Front Panel Ass'y (incl.No.84)	1
84	623 045 7690	Eyelet Rubber	1
85	623 084 8597	Label	1
86	623 084 8269	Label	1
87	623 096 5300	Label	1
88	623 089 0367	Mark	1
89	623 096 5317	Name Plate	1
90	623 096 5904	Compressor Ass'y C-R170HGS	1

NOTE: Metal and plastic parts will be supplied basically
with necessary heat insulation pads or packing.

For parts or service contact



SFS Corporation: 1200 West Artesia Blvd., Compton, California 90220

1989/Jul./TA/1500 Printed in Japan