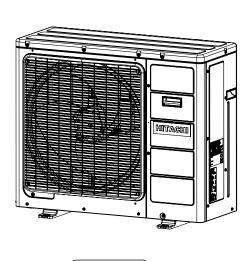
FEBRUARY 2015 Refrigeration & Air-Conditioning Division

ROOM AIR CONDITIONER OUTDOOR UNIT

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

ТҮРЕ			DC INVERTER FIVE SYSTEM MULTI
			OUTDOOR UNIT
MODEL	MODEL		RAM-90NP5B
POWER SOURCE			1ø, 220 - 240V, 50/60Hz
TOTAL INPUT		(W)	
TOTAL AMPERES			REFER TO THE SPECIFICATIONS PAGE
COOLING CAPACITY			REFER TO THE SPECIFICATIONS FAGE
HEATING CAPACITY		(B.T.U.)	
		w	950
DIMENSIONS	(mm)	Н	800
		D	370
NET WEIGHT (kg)		(kg)	74

SPECIFICATIONS



RAM-90NP5B

FOR SERVICE PERSONNEL ONLY

HITACHI

SERVICE MANUAL

TECHNICAL INFORMATION

SPECIFICATIONS------5 INSTALLATION-----16 CONSTRUCTION AND DIMENSIONAL DIAGRAM ------20 WIRING DIAGRAM ------21 MAIN PARTS COMPONENT ------23 CIRCUIT DIAGRAM -----25 BLOCK DIAGRAM -----27 PRINTED WIRING BOARD LOCATION DIAGRAM ------28 BASIC MODE ------33 REFRIGERATING CYCLE DIAGRAM------53 DESCRIPTION OF MAIN CIRCUIT OPERATION------54 TROUBLE SHOOTING -----65 PARTS LIST AND DIAGRAM------79

* After installation

NO. 0586E PM

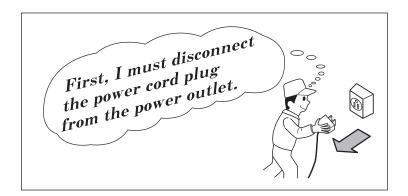
RAM-90NP5B

REFER TO THE FOUNDATION MANUAL

CONTENTS

SAFETY DURING REPAIR WORK

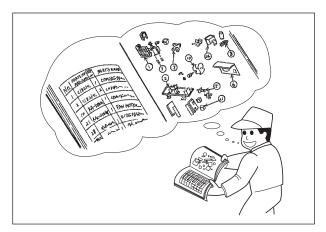
1. In order to disassemble and repair the unit in question, be sure to disconnect the power cord plug from the power outlet before starting the work.



If it is necessary to replace any parts, they should be replaced with respective genuine parts for the unit, and the replacement must be effected in correct manner according to the instructions in the Service Manual of the unit.

If the contacts of electrical parts are defective, replace the electrical parts without trying to repair them.

- 3. After completion of repairs, the initial state should be restored.
- 4. Lead wires should be connected and laid as in the initial state.
- 5. Modification of the unit by the user himself should absolutely be prohibited.



- 6. Tools and measuring instruments for use in repairs or inspection should be accurately calibrated in advance.
- 7. In installing the unit having been repaired, be careful to prevent the occurence of any accident such as electrical shock, leak of current, or bodily injury due to the drop of any part.
- 8. To check the insulation of the unit, measure the insulation resistance between the power cord plug and grounding terminal of the unit. The insulation resistance should be $1M\Omega$ or more as measured by a 500V DC megger.
- The initial location of installation such as window, floor or the other should be checked for being and safe enough to support the repaired unit again.
 If it is found not so strong and safe, the unit should be installed at the initial location after reinforced or at a new location.
- 10. Any inflammable object must not be placed about the location of installation.
- 11. Check the grounding to see whether it is proper or not, and if it is found improper, connect the grounding terminal to the earth.



WORKING STANDARDS FOR PREVENTING BREAKAGE OF SEMICONDUCTORS

1. Scope

The standards provide for items to be generally observed in carrying and handling semiconductors in relative manufacturers during maintenance and handling thereof. (They apply the same to handling of abnormal goods such as rejected goods being returned).

- 2. Object parts
 - (1) Micro computer
 - (2) Integrated circuits (I.C.)
 - (3) Field-effective transistor (F.E.T.)
 - (4) P.C. boards or the like to which the parts mentioned in (1) and (2) of this paragraph are equipped.
- 3. Items to be observed in handling
 - (1) Use a conductive container for carrying and storing of parts. (Even rejected goods should be handled in the same way).

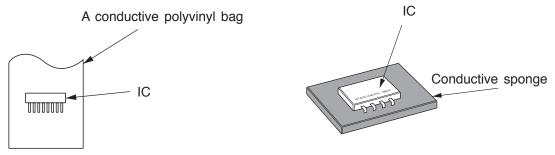


Fig. 1. Conductive container

- (2) When any part is handled uncovered (in counting, packing and the like), the handling person must always use himself as a body earth. (Make yourself a body earth by passing $1M\Omega$ earth resistance through a ring or bracelet).
- (3) Be careful not to touch the parts with your clothing when you hold a part even if a body earth is being taken.
- (4) Be sure to place a part on a metal plate with grounding.
- (5) Be careful not to fail to turn off power when you repair the printed circuit board. At the same time, try to repair the printed circuit board on a grounded metal plate.

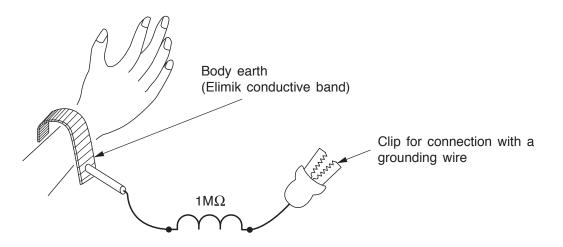


Fig. 2. Body Earth

(6) Use a three wire type soldering iron including a grounding wire.

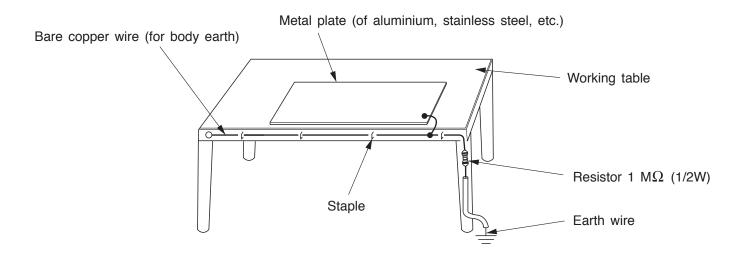


Fig. 3. Grounding of the working table

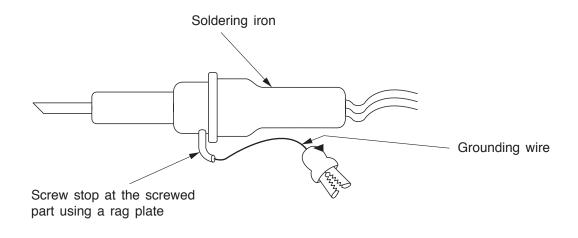


Fig. 4. Grounding a solder iron

Use a high insulation mode (100V, 10M Ω or higher) when ordinary iron is to be used.

(7) In checking circuits for maintenance, inspection or some others, be careful not to have the test probes of the measuring instrument short circuit a load circuit or the like.

- 1. In quiet operation or stopping the running, slight flowing noise of refrigerant in the refrigerating cycle is heard occasionally, but this noise is not abnormal for the operation.
- 2. When it thunders nearby, it is recommend to stop the operation and to disconnect the power cord plug from the power outlet for safety.
- 3. In the event of power failure, the air conditioner will restart automatically in the previously selected mode once the power is restored. In the event of power failure during TIMER operation, the air conditioner will not start automatically. Re-press ON/OFF button after 3 minutes from when the unit off or power recovery.
- 4. If the room air conditioner is stopped by adjusting thermostat, or miss operation, and re-start in a moment, there is occasion that the cooling and heating operation does not start for 3 minutes, it is not abnormal and this is the result of the operation of IC delay circuit. This IC delay circuit ensures that there is no danger of blowing fuse or damaging parts even if operation is restarted accidentally.
- 5. This room air conditioner should not be used at the cooling operation when the outside temperature is below -10°C (14°F).
- This room air conditioner (the reverse cycle) should not be used when the outside temperature is below -15°C (5°F).
 If the reverse cycle is used under this condition, the outside heat exchanger is frosted and efficiency falls.
- 7. When the outside heat exchanger is frosted, the frost is melted by operating the hot gas system, it is not trouble that at this time fan stops and the vapour may rise from the outside heat exchanger.

SPECIFICATIONS

MODEL		RAM-90NP5B		
FAN MOTOR		138 W		
FAN MOTOR CAPACITOR		NO		
FAN MOTOR PROTECTOR		NO		
COMPRESSOR		JU182XC1		
COMPRESSOR MOTOR CAP	ACITOR	NO		
OVERLOAD PROTECTOR		YES		
OVERHEAT PROTECTOR		YES		
FUSE (for MICROPROCESSC	PR)	20A, 5.0A		
POWER RELAY		G4A		
POWER SWITCH		NO		
TEMPORARY SWITCH		NO		
SERVICE SWITCH (TEST SW	/ITCH)	YES		
TRANSFORMER		NO		
VARISTOR		ERZVA9V431		
NOISE SUPPRESSOR		YES		
THERMOSTAT		YES(IC)		
REMOTE CONTROL SWITCH	(LIQUID CRYSTAL)	NO		
	UNIT	2700g		
REFRIGERANT CHARGING VOLUME (Refrigerant 410A)		WITHOUT REFRIGERANT BECAUSE COUPLING IS FLARE TYPE.		
	PIPES	MAX. 75m		
<u>.</u>				

In case the pipe length is more than 30m, add refrigerant R410 at 15gram per every meter exceeds.

SPECIFICATIONS FOR INDOOR UNITS COMBINATION

	Т	YPE		DC INVERTER FIVE SYSTEM MULTI COOLING AND HEATING			
MODEL		OUTDOOF	RUNIT	RAM-90NP5B			
PHESE/	VOLTA	GE/FREQU	ENCY	1ø, 220 - 240V, 50/60Hz			
CIRCUIT AN	MPERE	ES TO CONI	NECT (A)	25			
	CAPACI		′ (kW)	8.5			
	(B.T.U./h)			29,020			
COOLING		TOTAL INP	UT (W)	2,230			
(FIVE UNITS)		EER (B.T.	Г.U./hW) 13.01				
	TOTAL AMPERES (A) POWER FACTOR (%)		ERES (A)	10.20 - 9.40			
			TOR (%)	99			
	CAPACITY (kW)		(kW)	11.00			
		(B.T.U./h)		37,540			
HEATING		TOTAL INP	UT (W)	2,460			
(FIVE UNITS)	E UNITS) EER (B.T.U./hW		J./hW)	15.26			
	-	TOTAL AMPE	ERES (A)	11.3 - 10.4			
	F	POWER FAC	TOR (%)	99			
MAXIMU	JM LE	NGTH OF P	PING	MAX. 75m (FIVE UNIT TOTAL)			
	STA	NDARD		CE (EMC&LVD)			
MODEL				RAM-90NP5B			
		w		1,037			
PACKING		Н	896				

PAC	CKING	Н	896			
	(mm)	D	417			
		cu.ft.	13.68			
GRO	GROSS WEIGHT (kg)		75			
FLA	FLARE NUT SIZE (SMALL/LARGE)		6.35DX5/9.52DX3/12.70X2			

OPERATION SCOPE

	INDOOR SUCTION TEMPERATURE (°C)	OUTDOOR SUCTION TEMPERATURE (°C)	INDOOR SUCTION HUMIDITY (%)
COOLING OPERATION SCOPE	16 - 32	-10 ~ 43	BELOW 80
HEATING OPERATION SCOPE	BELOW 27	–15 ~ 21	_

DC INVERTER SYSTEM MULTI R.A.C. *RAM-90NP5B* COOL / HEAT CAPACITY SPEC. FOR INDOOR UNITS COMBINATIONS TO BE ABLE TO OPERATE SIMULTANEOUSLY

Whichever indoor units are installed, cooling and heating capacity depends on how many and which indoor units are operating at that time.

5 ROOM MULTI-SPLIT INVERTER TYPE RAC : RAM-90NP5B POSSIBLE COMBINATION TO OPERATE (SAME TIME OPERATION)

(Reference value)

				COC	UNG OUTDOOR UNIT POWER						HEATING	OUTDOOR UNIT			
PC	SSIBLE	COMBINATIONS TO OPERATE	CAPACITY RATING(kW) (RANGE) (kW) (RANGE)		CONSUMPTION	AMPERE (A) at	COP			CAPACITY RATING(kW) (RANGE) (kW) (RANGE)		POWER CONSUMPTION	AMPERE (A) at		COP
	1.5	1.5	1.50	TOTAL 1.50	(W) 420	220 230 240V 1.9 1.8 1.8	3.57	2.00	2.00	2.00	TOTAL 2.00	(W) 620	220 - 230 2.85 - 2.72	240V 2.61	3.23
	1.8	1.8	(1.00-1.60) 1.80	1.80	(320-480) 500	2.3 - 2.2 - 2.1	3.60	2.00	2.50	(1.50-2.20) 2.50	2.00	(360-850) 780	3.58 - 3.43	3.28	3.2
LIND	2.5	2.5	(1.70-2.00) 2.50	2.50	(320-610) 700	3.2 - 3.1 - 2.9	3.60	2.50	3.40	(2.00-3.00) 3.40	3.40	(360-920)	5.23 - 5.01	4.80	2.9
ONE		3.5	(1.70-2.80)	_	(320-860)	4.8 - 4.6 - 4.4			4.30	(2.00-4.00)		(360-1340)	6.52 - 6.24	5.98	3.0
-	3.5	5.0	(1.70-3.90) 5.00	3.50	(320-1270)	7.1 - 6.8 - 6.5	3.37	4.30	6.50	(2.00-5.20) 6.50	4.30	(360-1720)	10.56 - 10.10	9.68	2.8
	5.0	1.5 + 1.5	(1.70-5.50) 1.50 + 1.50	5.00	(320-1860)	3.9 - 3.7 - 3.6	3.25	6.50	2.00 + 2.00	(2.00-7.30) 2.00 + 2.00	6.50	(360-2580) 950	4.36 - 4.17	4.00	4.2
	3.0	1.5 + 1.8	(2.40 - 3.50) 1.50 + 1.80	3.00	(450-1020) 950	4.4 - 4.2 - 4.0	3.53	4.00	2.00 + 2.50	(2.70-4.5) 2.00 + 2.50	4.00	(480-1140)	5.42 - 5.18	4.97	3.6
	3.3	1.5 + 2.5	(2.40 - 3.80) 1.50 + 2.50	3.30	(450-1140) 1250	5.7 5.5 5.3	3.47	4.50	2.00 + 2.50	2.00 + 2.30 (2.70-5) 2.00 + 3.40	4.50	(480-1416)	6.06 5.80	5.56	4.0
	4.0		1.50 + 2.50 (2.40 - 4.50) 1.50 + 3.50	4.00	(450-1500) (450-1500)		3.20	5.40		2.00 + 3.40 (2.70-5.9) 2.00 + 4.30	5.40	(480-1584) 1550	7.12 6.81	6.52	
	5.0	1.5 + 3.5	1.50 + 3.50 (2.40 - 5.50) 1.50 + 5.00	5.00	(450-1860) 2100	7.1 - 6.8 - 6.5	3.23	6.30	2.00 + 4.30	(2.70-6.8)	6.30	(480-1860) 2300			4.0
	6.5	1.5 + 5.0	(2.40 7.00)	6.50	(450-2520)	9.6 9.2 8.8	3.10	8.50	2.00 + 6.50	(2.70-9)	8.50	(480-2760)	10.56 - 10.10	9.68	3.7
	3.6	1.8 + 1.8	1.80 + 1.80 (2.40-4.00) 1.80 + 2.50	3.60	820 (450-860)	3.8 - 3.6 - 3.5	4.39	5.00	2.50 + 2.50	2.50 + 2.50 (2.70-6.90)	5.00	1240 (480-1710)	5.69 - 5.45	5.22	4.0
UNITS	4.3	1.8 + 2.5	(2.40-4.70)	4.30	1000 (450-1190)	4.6 4.4 4.2	4.30	5.90	2.50 + 3.40	2.50 + 3.40 (2.7-7.7)	5.90	1530 (480-1990)	7.02 - 6.72	6.44	3.8
INO ON	5.3	1.8 + 3.5	1.80 + 3.50 (2.40-5.80)	5.30	1590 (450-1900)	7.3 - 7.0 - 6.7	3.33	6.80	2.50 + 4.30	2.50 + 4.30 (2.7-8.5)	6.80	1870 (480-2320)	8.59 8.21	7.87	3.6
Ę	6.8	1.8 + 5.0	1.80 + 5.00 (2.40-7.50)	6.80	2370 (450-2970)	10.9 - 10.4 - 10.0	2.87	9.00	2.50 + 6.50	2.39 + 6.21 (2.7-10.0)	8.60	2470 (480-2880)	11.34 - 10.85	10.40	3.4
1	5.0	2.5 + 2.5	2.50 + 2.50 (2.40-5.50)	5.00	1370 (450-1640)	6.3 - 6.0 - 5.8	3.65	6.80	3.40 + 3.40	3.40 + 3.40 2.7-8.5	6.80	1810 480-2250	8.31 - 7.95	7.62	3.7
l	6.0	2.5 + 3.5	2.50 + 3.50 (2.40-6.60)	6.00	2000 (450-2400)	9.2 - 8.8 - 8.4	3.00	7.70	3.40 + 4.30	3.40 + 4.30 2.7-9.2	7.70	2160 480-2590	9.92 - 9.49	9.09	3.5
l	7.5	2.5 + 5.0	2.50 + 5.00 (2.40-8.30)	7.50	2580 (450-3470)	11.8 - 11.3 - 10.9	2.91	9.90	3.40 + 6.50	3.16 + 6.04 2.7-10.5	9.20	2720 480-3110	12.49 - 11.95	11.45	3.3
1	7.0	3.5 + 3.5	3.50 + 3.50 (2.40-7.70)	7.00	2490 (450-2990)	11.4 - 10.9 - 10.5	2.81	8.60	4.30 + 4.30	4.30 + 4.30 2.70-10.0	8.60	2460 480-2860	11.29 - 10.80	10.35	3.5
1	8.5	3.5 + 5.0	3.50 + 5.00 (2.40-8.80)	8.50	2900 (450-3270)	13.3 12.7 12.2	2.93	10.80	4.30 + 6.50	3.86 + 5.84 2.7-11.0	9.70	2940 480-3320	13.50 - 12.91	12.37	3,3
	10.0	5.0 + 5.0	4.25 + 4.25 (2.40-9.20)	8.50	2930 (450-3460)	13.5 12.9 12.3	2.90	13.00	6.50 + 6.50	5.10 + 5.10 2.70-11.40	10.20	2860 480-3200	13.13 - 12.56	12.04	3.5
	4.5	1.5 + 1.5 + 1.5	1.50 + 1.50 + 1.50 (2.70 - 5.00)	4.50	1250 (510-1500)	5.7 - 5.5 - 5.3	3.60	6.00	2.00 + 2.00 + 2.00	2.00 + 2.00 + 2.00 (2.90-6.5)	6.00	1540 (520-1848)	7.07 - 6.76	6.48	3.9
	4.8	1.5 + 1.5 + 1.8	(2.70 + 3.00) 1.50 + 1.50 + 1.80 (2.70 - 5.30)	4.80	(510-1620) (510-1620)	6.2 - 5.9 - 5.7	3.56	6.50	2.00 + 2.00 + 2.50	(2.90-0.5) 2.00 + 2.00 + 2.50 (2.90-7)	6.50	(520-1848) (520-2160)	8.26 - 7.91	7.58	3.6
	5.5	1.5 + 1.5 + 2.5	(2.70 - 3.30) 1.50 + 1.50 + 2.50 (2.70 - 6.00)	5.50	1490 (510-1788)	6.8 - 6.5 - 6.3	3.69	7.40	2.00 + 2.00 + 3.40	2.00 + 2.00 + 3.40 (2.90-7.9)	7.40	2010 (520-2412)	9.23 - 8.83	8.46	3.6
	6.5	1.5 + 1.5 + 3.5	(2.70 - 6.00) 1.50 + 1.50 + 3.50 (2.70 - 7.00)	6.50	(510-1788) (510-2520)	9.6 - 9.2 - 8.8	3.10	8.30	2.00 + 2.00 + 4.30	(2.30-7.3) 2.00 + 2.00 + 4.30 (2.90-8.8)	8.30	(520-2412) 2420 (520-2904)	11.11 - 10.63	10.19	3.4
	8.0	1.5 + 1.5 + 5.0	(2.70 7.00) 1.50 + 1.50 + 5.00 (2.70 8.50)	8.00	(510-2520) (510-2676)	10.2 - 9.8 - 9.4	3.59	10.50	2.00 + 2.00 + 6.50	(2.90-50) 2.00 + 2.00 + 6.50 (2.90-11)	10.50	(320-2304) 2300 (520-2760)	10.56 - 10.10	9.68	4.5
	5.1	1.5 + 1.8 + 1.8	(2.70 8.50) 1.50 + 1.80 + 1.80 (2.70 5.60)	5.10	(510-2676) 1350 (510-1620)	6.2 5.9 5.7	3.78	7.00	2.00 + 2.50 + 2.50	(2.90-7.5) (2.90-7.5)	7.00	(520-2780) 1900 (520-2280)	8.72 - 8.34	8.00	3.6
	5.8	1.5 + 1.8 + 2.5	(2.70 - 5.60) 1.50 + 1.80 + 2.50 (2.70 - 6.30)	5.80	(510-1620) 1490 (510-1788)	6.8 - 6.5 - 6.3	3.89	7.90	2.00 + 2.50 + 3.40	(2.30-7.5) 2.00 + 2.50 + 3.40 (2.90-8.4)	7.90	(520-2280) 2180 (520-2616)	10.01 - 9.57	9.18	3.4
	6.8	1.5 + 1.8 + 3.5	(2.70 - 6.30) 1.50 + 1.80 + 3.50 (2.70 - 7.30)	6.80	(510-1788) 2370 (510-2844)	10.9 - 10.4 - 10.0	2.87	8.80	2.00 + 2.50 + 4.30	(2.90-8.4) 2.00 + 2.50 + 4.30 (2.90-9.3)	8.80	(520-2016) 2300 (520-2760)	10.56 - 10.10	9.68	3.
	8.3	1.5 + 1.8 + 5.0	(2.70 7.30) 1.50 + 1.80 + 5.00 (2.70 8.80)	8.30	(510-2844) 2230 (510-2676)	10.2 - 9.8 - 9.4	3.72	11.00	2.00 + 2.50 + 6.50	(2.90-9.3) 2.00 + 2.50 + 6.50 (2.90-11.5)	11.00	(520-2760) 2800 (520-3360)	12.86 - 12.30	11.78	3.1
	6.5	1.5 + 2.5 + 2.5	(2.70 - 6.80) 1.50 + 2.50 + 2.50 (2.70 - 7.00)	6.50	(510-2676) 2100 (510-2520)	9.6 - 9.2 - 8.8	3.10	8.80	2.00 + 3.40 + 3.40	(2.00 ^{-11.5}) 2.00 + 3.40 + 3.40 (2.90-9.3)	8.80	(520-3360) 2300 (520-2760)	10.56 - 10.10	9.68	3.
	7.5	1.5 + 2.5 + 3.5	(2.70 - 7.00) 1.50 + 2.50 + 3.50 (2.70 - 8.00)	7.50	2580	11.8 - 11.3 - 10.9	2.91	9.70	2.00 + 3.40 + 4.30	2.00 + 3.40 + 4.30	9.70	(520-2760) 2940 (520-3528)	13.50 - 12.91	12.37	3.5
	9.0	1.5 + 2.5 + 5.0	(2.70 - 8.00) 1.50 + 2.50 + 5.00 (2.70 - 9.50)	9.00	(510-3096) 2680	12.3 - 11.8 - 11.3	3.36	11.90	2.00 + 3.40 + 6.50	(2.90-10.2) 1.85 + 3.14 + 6.01	11.00	2800	12.86 - 12.30	11.78	3,1
	8.5	1.5 + 3.5 + 3.5	1.50 + 3.50 + 3.50	8.50	(510-3216) 2800	12.9 - 12.3 - 11.8	3.04	10.60	2.00 + 4.30 + 4.30	(2.90-11.5) 2.00 + 4.30 + 4.30	10.60	(520-3360) 2940	13.50 - 12.91	12.37	3.6
	10.0	1.5 + 3.5 + 5.0	(2.70 - 9.00) 1.35 + 3.15 + 4.50	9.00	(510-3360) 2680	12.3 - 11.8 - 11.3	3.36	12.80	2.00 + 4.30 + 6.50	(2.90-11.1) 1.72 + 3.70 + 5.59	11.00	(520-3528) 2800	12.86 - 12.30	11.78	3.9
	11.5	1.5 + 5.0 + 5.0	(2.70 - 9.50) 1.17 + 3.91 + 3.91	9.00	(510-3216) 2680	12.3 - 11.8 - 11.3	3.36	15.00	2.00 + 6.50 + 6.50	(2.90-11.5) 1.47 + 4.77 + 4.77	11.00	(520-3360) 2800	12.86 - 12.30	11.78	3.8
	5.4	1.8 + 1.8 + 1.8	(2.70 9.50) 1.80 + 1.80 + 1.80	5.40	(510-3216) 1480	6.8 - 6.5 - 6.2	3.65	7.50	2.50 + 2.50 + 2.50	(2.90-11.5) 2.50 + 2.50 + 2.50	7.50	(520-3360) 2020	9.27 - 8.87	8.50	3.3
ø	6.1	1.8 + 1.8 + 2.5	(2.70-5.90) 1.80 + 1.80 + 2.50	6.10	(510-1780) 1780	8.2 - 7.8 - 7.5	3.43	8.40	2.50 + 2.50 + 3.40	2.9-9.1 2.38 + 2.38 + 3.24	8.00	520-2440 2210	10.15 - 9.71	9.30	3.4
UNITS	7.1	1.8 + 1.8 + 3.5	(2.70-6.70) 1.80 + 1.80 + 3.50	7.10	(510-2150) 1910	8.8 - 8.4 - 8.0	3.72	9.30	2.50 + 2.50 + 4.30	2.9-9.5 2.37 + 2.37 + 4.06	8.80	520-2620 2370	10.88 - 10.41	9.97	3.3
HREE	8.6	1.8 + 1.8 + 5.0	(2.70-7.80) 1.78 + 1.78 + 4.94	8.50	(510-2310) 2650	12.2 - 11.6 - 11.2	3.21	11.50	2.50 + 2.50 + 6.50	2.9-10.2 2.20 + 2.20 + 5.70	10.10	520-2740 2730	12.53 - 11.99	11.49	3.3
1	6.8	1.8 + 2.5 + 2.5	(2.70-9.50) 1.80 + 2.50 + 2.50	6.80	(510-3260) 1860	8.5 - 8.2 - 7.8	3.66	9.30	2.50 + 3.40 + 3.40	2.9+11.3 2.30 + 3.15 + 3.15	8.60	520-3060 2370	10.88 - 10.41	9.97	3.6
l	7.8	1.8 + 2.5 + 3.5	(2.70-7.50) 1.80 + 2.50 + 3.50	7.80	(510-2260) 2190	10.1 - 9.6 - 9.2	3.56	10.20	2.50 + 3.40 + 4.30	2.9-10.0 2.30 + 3.13 + 3.96	9.40	520-2760 2530	11.62 - 11.11	10.65	3.3
l	9.3	1.8 + 2.5 + 5.0	(2.7-8.6) 1.66 + 2.26 + 4.58	8.50	(510-2660) 2550	11.7 - 11.2 - 10.7	3.33	12,40	2.50 + 3.40 + 6.50	2.90-10.7 2.10 + 2.85 + 5.45	10.40	520-2880 2890	13.27 - 12.69	12.16	3.4
1	9.3	1.8 + 3.5 + 3.5	(2.70-9.90) 1.74 + 3.38 + 3.38	8.50	(510-3270) 2600	11.9 - 11.4 - 10.9	3.33	12.40	2.50 + 4.30 + 4.30	2.9-11.6 2.34 + 4.03 + 4.03	10.40	520-3220 2750	12.63 - 12.08	11.57	3.7
	10.3	1.8 + 3.5 + 5.0	(2.70-9.70) 1.47 + 2.88 + 4.16	8.50	(510-3260) 2590	11.9 - 11.4 - 10.9	3.28	13.30	2.50 + 4.30 + 6.50	2.9-11.6 1.95 + 3.36 + 5.09	10.40	520-3060 2990	13.73 - 13.13	12.58	3.4
1	10.3	1.8 + 5.0 + 5.0	(2.70-9.90) 1.31 + 3.60 + 3.60	8.50	(510-3320) 2590	11.9 - 11.4 - 10.9	3.28	13.30	2.50 + 6.50 + 6.50	2.9-11.6 1.68 + 4.36 + 4.36	10.40	520-3330 2990	13.73 - 13.13	12.58	3.4
l	7.5	2.5 + 2.5 + 2.5	(2.70-9.90) 2.50 + 2.50 + 2.50	7.50	(510-3320) 2120	9.7 - 9.3 - 8.9	3.28	15.50	3.40 + 3.40 + 3.40	2.9+11.6 3.00 + 3.00 + 3.00	9,00	520-3330 2540	11.66 - 11.16	10.69	3.5
1	7.5	2.5 + 2.5 + 3.5	(2.70-8.30) 2.50 + 2.50 + 3.50	7.50	(510-2580) 2560	11.8 - 11.2 - 10.8	3.54	10.20	3.40 + 3.40 + 4.30	2.9-10.4 3.06 + 3.06 + 3.87	9.00	520-2920 2730	12.53 - 11.99	11.49	3.4
1	8.5	2.5 + 2.5 + 5.0	(2.70-9.4) 2.13 + 2.13 + 4.25	8.50	(510-3110) 2620	12.0 - 11.5 - 11.0	3.32	11.10	3.40 + 3.40 + 6.50	2.9-11.2 2.66 + 2.66 + 5.08	10.00	520-3070 2990	13.73 - 13.13	12.58	3.
		2.5 + 3.5 + 3.5	(2.70-9.90) 2.23 + 3.13 + 3.13		(510-3360) 2600	11.9 - 11.4 - 10.9			3.40 + 4.30 + 4.30	2.9-11.6 2.95 + 3.73 + 3.73		520-3330 2890	13.27 - 12.69	12.16	3.0
l	9.5	2.5 + 3.5 + 5.0	(2.70-9.90)	8.50	(510-3330)	12.0 - 11.5 - 11.0	3.27	12.00	3.40 + 4.30 + 6.50	2.9-11.6 2.49 + 3.14 + 4.77	10.40	520-3220 2990	13.73 - 13.13	12.58	3.4
l	11.0	2.5 + 5.0 + 5.0	(2.70-9.90) 1.70 + 3.40 + 3.40	8.50	(510-3350)	12.0 - 11.5 - 11.0	3.24	14.20	340 + 650 + 650	2.9-11.6 2.18 + 4.16 + 4.16	10.40	520-3330 2990	13.73 - 13.13	12.58	3.
l	12.5	3.5 + 3.5 + 3.5	(2.70-9.90) 2.83 + 2.83 + 2.83	8.50	(510-3360)	11.9 - 11.4 - 10.9	3.24	16.40	4.30 + 4.30 + 4.30	2.9-11.7 3.47 + 3.47 + 3.47	10.50	520-3320 2990	13.73 - 13.13	12.58	3.4
1	10.5	3.5 + 3.5 + 5.0	2.63 + 2.63 + 2.63 (2.70-9.90) 2.50 + 2.50 + 3.49	8.50	2600 (510-3320) 2620	12.0 - 11.5 - 11.0	3.27	12.90	4.30 + 4.30 + 4.30	2.9-11.6 2.99 + 3.01 + 4.47	10.40	2990 520-3330 2990	13.73 13.13	12.50	3.6
l	12.0	3.5 + 5.0 + 5.0	2.50 + 2.50 + 3.49 (2.70-9.90) 2.17 + 3.17 + 3.17	8.50	(510-3360) 2620	12.0 - 11.5 - 11.0	3.24	15.10	4.30 + 4.30 + 6.50	2.99 + 3.01 + 4.47 2.9-11.7 2.61 + 3.97 + 3.97	10.50	2990 520-3320 2990	13.73 - 13.13	12.56	3.1
l	13.5	5.0 + 5.0 + 5.0	(2 70-9 90)	8.50	(510-3360)	12.0 - 11.8 - 11.3	3.24	17.30	6.50 + 6.50 + 6.50	29-117	10.50	520-3320 2890	13.27 - 12.69	12.00	3.8
L	15.0	0.0 + 0.0 + 0.0	2.83 + 2.83 + 2.83 (2.70-9.90)	8.50	(510-3450)	12.9 - 11.0 - 11.3	3,16	19.50	0.00 + 0.00 + 0.00	3.67 + 3.67 + 3.67 2.9-12.1	11.00	2890 520-3180	10.27 - 12.69	12,18	3.8

														_
6.0		1.50 + 1.50 + 1.50 + 1.50 (2.90 - 6.50)	6.00	1350 (550-1620)	6.2 - 5.9 - 5.7	4.44	8.00	2.00 + 2.00 + 2.00 + 2.00	2.00 + 2.00 + 2.00 + 2.00 (3.00-8.5) 2.00 + 2.00 + 2.00 + 2.50 (3.00.9)	8.00	(540-2652)	10.15 - 9.71	9.30	3.62
6.3		1.50 + 1.50 + 1.50 + 1.80 (2.90 - 6.80	6.30	1480 (550-1776)	6.8 - 6.5 - 6.2	4.26	8.50	2.00 + 2.00 + 2.00 + 2.50		8.50	2300 (540-2760)	10.56 - 10.10	9.68	3.70
7.0	1.5 + 1.5 + 1.5 + 2.5	1.50 + 1.50 + 1.50 + 2.50 (2.90 - 7.50) 1.50 + 1.50 + 1.50 + 3.50	7.00	1780 (550-2136)	8.2 - 7.8 - 7.5	3.93	9.40	2.00 + 2.00 + 2.00 + 3.40	2.00 + 2.00 + 2.00 + 3.40 (3.00-9.9) 2.00 + 2.00 + 2.00 + 4.30 (2.00 + 0.9)	9.40	2530 (540-3036)	11.62 11.11	10.65	3.72
8.0	1.5 + 1.5 + 1.5 + 3.5	1.50 + 1.50 + 1.50 + 3.50 (2.90 - 8.50)	8.00	1910 (550-2292)	8.8 - 8.4 - 8.0	4.19	10.30	2.00 + 2.00 + 2.00 + 4.30	2.00 + 2.00 + 2.00 + 4.30 (3.00-10.8)	10.30	2890 (540-3468)	13.27 - 12.69	12.16	3.56
9.6	1.5 + 1.5 + 1.5 + 5.0	1.34 + 1.34 + 1.34 + 4.47 (2.90 - 9.00)	8.50	2650 (550-3180)	12.2 11.6 11.2	3.21	12.50	2.00 + 2.00 + 2.00 + 6.50	1.76 + 1.76 + 1.76 + 5.72 (3.00-11.5)	11.00		12.86 12.30	11.78	3,93
6.6	1.5 + 1.5 + 1.8 + 1.8	150 + 150 + 180 + 180	6.60	1750	8.0 7.7 7.4	3.77	9.00	2.00 + 2.00 + 2.50 + 2.50	2.00 + 2.00 + 2.50 + 2.50	9.00	2800 (540-3360) 2540 (540-3048)	11.66 11.16	10.69	3.54
7.5	1.5 + 1.5 + 1.8 + 2.5	(2.90 - 7.10) 1.50 + 1.50 + 1.80 + 2.50	7.30	(550-2100) 1850	8.5 - 8.1 - 7.8	3.95	9.90	2.00 + 2.00 + 2.50 + 3.40	(3.00-9.5) 2.00 + 2.00 + 2.50 + 3.40	9.90	2620	12.03 - 11.51	11.03	3.78
8.3		(2.90 - 7.80) 1.50 + 1.50 + 1.80 + 3.50	8.30	(550-2220) 2180	10.0 - 9.6 - 9.2	3.81	10.80	2.00 + 2.00 + 2.50 + 4.30	(3.00-10.4) 2.00 + 2.00 + 2.50 + 4.30	10.80	(540-3144) 2890	13.27 12.69	12.16	3,74
9.6	1.5 + 1.5 + 1.8 + 5.0	(2.90 - 8.80) 1.30 + 1.30 + 1.56 + 4.34	8.50	(550-2616) 2600	11.9 - 11.4 - 10.9	3.01	13.00	2.00 + 2.00 + 2.50 + 6.50	(3.00-11.3) 1.69 + 1.69 + 2.12 + 5.50	11.00	(540-3468) 2800	12.86 - 12.30	11.78	3.93
	15 + 15 + 25 + 25	(2.90 - 9.00) 1.50 + 1.50 + 2.50 + 2.50		(550-3120)	9.9 - 9.4 - 9.0			200 + 200 + 340 + 340	(3.00-11.5) 2.00 + 2.00 + 3.40 + 3.40		(540-3360) 2850	13.09 - 12.52	11.99	3.79
8.0	1.5 + 1.5 + 2.5 + 3.5	(2.90 8.50) 1.42 + 1.42 + 2.36 + 3.31	8.00	(550-2580) 2600	11.9 - 11.4 - 10.9	3.72	10.80	200 + 200 + 340 + 430	(3.00-11.3) 1.88 + 1.88 + 3.20 + 4.04	10.80	(540-3420) 2800	12.86 - 12.30	11.78	3,93
9.0		(2.90 - 9.00)	8.50	(550-3120) 2600	11.9 - 11.4 - 10.9	3.27	11.70		(3.00-11.5)	11.00	(540-3360)	12.86 - 12.30	11.78	
10.		(2.90 - 9.00)	8.50	(550-3120)		3.27	13.90		(3.00-11.5)	11.00	2800 (540-3360) 2900			3.93
10.		1.28 + 1.28 + 2.98 + 2.98 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	12.60	2.00 + 2.00 + 4.30 + 4.30	1.75 + 1.75 + 3.75 + 3.75 (3.00-11.5)	11.00	(540-3480)	13.31 - 12.74	12.21	3.79
11.		1.11 + 1.11 + 2.59 + 3.70 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	14.80	2.00 + 2.00 + 4.30 + 6.50	1.49 + 1.49 + 3.20 + 4.83 (3.00-11.5)	11.00	2800 (540-3360)	12.86 - 12.30	11,78	3.93
13.	1.5 + 1.5 + 5.0 + 5.0	0.98 + 0.98 + 3.27 + 3.27 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	17.00	2.00 + 2.00 + 6.50 + 6.50	1.29 + 1.29 + 4.21 + 4.21 (3.00-11.5)	11.00	2800 (540-3360)	12.86 - 12.30	11.78	3.93
6.9	1.5 + 1.8 + 1.8 + 1.8	1.50 + 1.80 + 1.80 + 1.80 (2.90 - 7.40)	6.90	1870 (550-2244)	8.6 - 8.2 - 7.9	3.69	9.50	2.00 + 2.50 + 2.50 + 2.50	2.00 + 2.50 + 2.50 + 2.50 (3.00-10)	9.50	2620 (540-3144)	12.03 - 11.51	11.03	3.63
7.6	1.5 + 1.8 + 1.8 + 2.5	(2.90 + 1.80 + 1.80 + 2.50) (2.90 - 8.10)	7.60	(550-2568) (550-2568)	9.8 - 9.4 - 9.0	3.55	10.40	2.00 + 2.50 + 2.50 + 3.40	2.00 + 2.50 + 2.50 + 3.40 (3.00-10.9)	10.40	2890 (540-3468)	13.27 12.69	12.16	3.60
8.6	1.5 + 1.8 + 1.8 + 3.5	1.48 + 1.78 + 1.78 + 3.46	8.50	2550	11.7 - 11.2 - 10.7	3.33	11.30	2.00 + 2.50 + 2.50 + 4.30	1.95 + 2.43 + 2.43 + 4.19	11.00	2800	12.86 - 12.30	11.78	3.93
10.	1.5 + 1.8 + 1.8 + 5.0	(2.90 - 9.00) 1.26 + 1.51 + 1.51 + 4.21	8.50	(550-3060) 2600	11.9 - 11.4 - 10.9	3.27	13.50	2.00 + 2.50 + 2.50 + 6.50	(3.00-11.5) 1.63 + 2.04 + 2.04 + 5.30	11.00	(540-3360) 2800	12.86 - 12.30	11.78	3.93
8.3	1.5 + 1.8 + 2.5 + 2.5	(2.90 - 9.00) 1.50 + 1.80 + 2.50 + 2.50	8.30	(550-3120) 2740	12.6 12.0 11.5	3.03	11.30	2.00 + 2.50 + 3.40 + 3.40	(3.00-11.5) 1.95 + 2.43 + 3.31 + 3.31	11.00	(540-3360) 2800	12.86 12.30	11.78	3,93
9.3	1.5 + 1.8 + 2.5 + 3.5	(2.90 - 8.80) 1.37 + 1.65 + 2.28 + 3.20	8.50	(550-3288) 2600	11.9 - 11.4 - 10.9	3.03	12.20	2.00 + 2.50 + 3.40 + 4.30	(3.00-11.5) 1.80 + 2.25 + 3.07 + 3.88	11.00	(540-3360) 2800	12.86 - 12.30	11.78	3.93
9.3		(2.90 - 9.00) 1.18 + 1.42 + 1.97 + 3.94	8.50	(550-3120) 2600	11.9 - 11.4 - 10.9	3.27	14.40	2.00 + 2.50 + 3.40 + 6.50	(3.00-11.5) 1.53 + 1.91 + 2.60 + 4.97	11.00	(540-3360) 2800	12.86 - 12.30	11.78	3.93
		(2.90 - 9.00) 1.24 + 1.49 + 2.89 + 2.89		(550-3120) 2600	11.9 11.4 10.9	3.27	14.40	2.00 + 2.50 + 4.30 + 4.30	(3.00-11.5) 1.68 + 2.10 + 3.61 + 3.61	11.00	(540-3360) 2800	12.86 12.30	11.78	3,93
10.		(2.90 - 9.00)	8.50	(550-3120)	11.9 - 11.4 - 10.9			2.00 + 2.50 + 4.30 + 6.50	(3.00-11.5) 1.44 + 1.80 + 3.09 + 4.67		(540-3360) 2800	12.86 - 12.30	11.78	3.93
11.	,	(2.90 - 9.00)	8.50	(550-3120)	11.9 - 11.4 - 10.9	3.27	15.30	200 + 250 + 650 + 650	(3.00-11.5) 1.26 + 1.57 + 4.09 + 4.09	11.00	(540-3360)	12.86 - 12.30	11.76	3.93
13.	,	(2.90 9.00)	8.50	(550-3120)		3.27	17.50		(3.00-11.5)	11.00	(540-3360)		11.78	
9.0		(2.90 - 9.00)	8.50	2610 (550-3132)		3.26	12.20	2.00 + 3.40 + 3.40 + 3.40	(3.00-11.5)	11.00	(540-3360)			3,93
10.		1.28 + 2.13 + 2.13 + 2.98 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	13.10	2.00 + 3.40 + 3.40 + 4.30	1.68 + 2.85 + 2.85 + 3.61 (3.00-11.5)	11.00	2800 (540-3360)	12.86 - 12.30	11.78	3.93
11.	1.5 + 2.5 + 2.5 + 5.0	1.11 + 1.85 + 1.85 + 3.70 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	15.30	2.00 + 3.40 + 3.40 + 6.50	1.44 + 2.44 + 2.44 + 4.67 (3.00-11.5)	11.00	2800 (540-3360)	12.86 - 12.30	11.78	3,93
11.	1.5 + 2.5 + 3.5 + 3.5	1.16 + 1.93 + 2.70 + 2.70 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 11.4 10.9	3.27	14.00	2.00 + 3.40 + 4.30 + 4.30	1.57 + 2.67 + 3.38 + 3.38 (3.00-11.5)	11.00	2800 (540-3360)	12.86 - 12.30	11.78	3,93
12.	1.5 + 2.5 + 3.5 + 5.0	1.02 + 1.70 + 2.38 + 3.40 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	16.20	2.00 + 3.40 + 4.30 + 6.50	1.36 + 2.31 + 2.92 + 4.41 (3.00-11.5)	11.00	2800 (540-3360)	12.86 - 12.30	11.78	3.93
14.	1.5 + 2.5 + 5.0 + 5.0	0.91 + 1.52 + 3.04 + 3.04 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	18.40	2.00 + 3.40 + 6.50 + 6.50	1.20 + 2.03 + 3.89 + 3.89 (3.00-11.5)	11.00	2800 (540-3360)	12.86 - 12.30	11.78	3.93
12.	1.5 + 3.5 + 3.5 + 3.5	1.06 + 2.48 + 2.48 + 2.48 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	14.90	2.00 + 4.30 + 4.30 + 4.30	1.48 + 3.17 + 3.17 + 3.17 (3.00-11.5)	11.00	2800 (540-3360)	12.86 12.30	11.78	3,93
L 13.	1.5 + 3.5 + 3.5 + 5.0	(2.30 - 3.00) 0.94 + 2.20 + 2.20 + 3.15 (2.90 - 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	17.10	2.00 + 4.30 + 4.30 + 6.50	(3.00-11.5) 1.29 + 2.77 + 2.77 + 4.18 (3.00-11.5)	11.00	(540-3360) (540-3360)	12.86 - 12.30	11.78	3.93
15.	1.5 + 3.5 + 5.0 + 5.0	(2.90 9.00) 0.85 + 1.98 + 2.83 + 2.83 (2.90 9.00)	8.50	2600 (550-3120)	11.9 - 11.4 - 10.9	3.27	19.30	2.00 + 4.30 + 6.50 + 6.50	(3.00-11.5) 1.14 + 2.45 + 3.70 + 3.70 (3.00-11.5)	11.00	(540-3360) (540-3360)	12.86 - 12.30	11.78	3.93
7.1	1.8 + 1.8 + 1.8 + 1.8	100 100 100 100	7.20	1800	8.3 - 7.9 - 7.6	4.00	10.00	2.50 + 2.50 + 2.50 + 2.50	2.40 + 2.40 + 2.40 + 2.40	9.60	2400	11.02 10.54	10.10	4.00
7.9	1.8 + 1.8 + 1.8 + 2.5	1.80 + 1.80 + 1.80 + 1.80 (2.90-7.90) 1.80 + 1.80 + 1.80 + 2.50 (2.90-8.70)	7.90	(550-2310) 2090	9.6 - 9.2 - 8.8	3 78	10.90	2.50 + 2.50 + 2.50 + 3.40	3.0-10.9 2.25 + 2.25 + 2.25 + 3.06	9.80	540-2720 2700	12.40 - 11.86	11.36	3.63
8.9	1.8 + 1.8 + 1.8 + 3.5	1.72 + 1.72 + 1.72 + 3.34	8.50	(550-2690) 2415	11.1 - 10.6 - 10.2	3.52	11.80	2.50 + 2.50 + 2.50 + 4.30	3.0-11.1 2.16 + 2.16 + 2.16 + 3.72	10.20	540-3050 2700	12.40 11.86	11.36	3.78
10.	1.8 + 1.8 + 1.8 + 5.0	(2.90-9.80) 1.46 + 1.46 + 1.46 + 4.11	8.50	(550-3260) 2390	11.0 - 10.5 - 10.1	3.56	14.00	2.50 + 2.50 + 2.50 + 6.50	3.0-11.4 1.82 + 1.81 + 1.81 + 4.76	10.20	540-3020 2700	12.40 - 11.86	11.36	3.78
8.6	1.8 + 1.8 + 2.5 + 2.5	(2.90-9.90) 1.78 + 1.78 + 2.47 + 2.47	8.50	(550-3260) 2320	10.7 - 10.2 - 9.8	3.66	11.80	2.50 + 2.50 + 3.40 + 3.40	3.0-11.4 2.12 + 2.12 + 2.88 + 2.88	10.00	540-3020 2700	12.40 - 11.86	11.36	3.70
9.6	1.8 + 1.8 + 2.5 + 3.5	(2.90-9.50) 1.59 + 1.59 + 2.21 + 3.10	8.50	(550-3040) 2390	11.0 - 10.5 - 10.1	3.56	12.70	2.50 + 2.50 + 3.40 + 4.30	2.12 + 2.12 + 2.88 + 2.88 3.0-11.2 2.01 + 2.01 + 2.73 + 3.45 3.0-11.4	10.20	540-3030 2700	12.40 - 11.86	11.36	3.78
		(2.90-9.9) 1.37 + 1.37 + 1.90 + 3.88		(550-3260) 2390	11.0 10.5 10.1	3.56	12.70	2.50 + 2.50 + 3.40 + 6.50	3.0-11.4 1.71 + 1.70 + 2.32 + 4.50	10.20	540-3020 2700	12.40 - 11.86	11.36	3.78
11.		(2.90-9.9) 1.44 + 1.44 + 2.81 + 2.81	8.50	(550-3260)	11.0 - 10.5 - 10.1	0.00		2.50 + 2.50 + 4.30 + 4.30	3.0-11.4 1.88 + 1.88 + 3.23 + 3.23	10.20	540-3020 2700	12.40 - 11.86	11.36	3,78
10.	1	(2.90-9.90) 1.27 + 1.27 + 2.46 + 3.49	8.50	(550-3260) 2390	11.0 - 10.5 - 10.1	3.56	13.60	2.50 + 2.50 + 4.30 + 6.50	3.0-11.4 1.61 + 1.62 + 2.78 + 4.18	10.20	540-3020 2700	12.40 - 11.86	11.36	0.70
12.		(2.90-9.90)	8.50	2390 (550-3260) 2370	11.0 - 10.5 - 10.1	3.56	15.80	2.50 + 2.50 + 4.30 + 6.50	1.61 + 1.62 + 2.78 + 4.18 3.0-11.4 1.44 + 1.45 + 3.75 + 3.75	10.20	2700 540-3020 2700	12.40 - 11.86	11.36	3.78
13.		1.14 + 1.14 + 3.12 + 3.12 (2.90-9.90) 1.71 + 2.26 + 2.26 + 2.26	8.50	2370 (550-3230)	10.9 - 10.4 - 10.0	3.59	18.00	2.50 + 2.50 + 6.50 + 6.50 2.50 + 3.40 + 3.40 + 3.40	1.44 + 1.45 + 3.75 + 3.75 3.0-11.6 2.01 + 2.71 + 2.71 + 2.71	10.40	2700 540-3010	12.40 - 11.86	11.36	
9.3		(2.90-9.90)	8.50	2390 (550-3260)		3.56	12.70		3.0-11.4		2700 540-3020			3.78
10.		1.52 + 2.08 + 2.08 + 2.83 (2.90-9.90)	8.50	2390 (550-3260)	11.0 - 10.5 - 10.1	3.56	13.60	2.50 + 3.40 + 3.40 + 4.30	1.88 + 2.57 + 2.57 + 3.17 3.0-11.4	10.20	2700 540-3020	12.40 - 11.86	11.36	3.78
11.		1.33 + 1.79 + 1.79 + 3.59 (2.90-9.90) 1.32 + 1.89 + 2.64 + 2.64	8.50	2390 (550-3260)	11.0 - 10.5 - 10.1	3.56	15.80	2.50 + 3.40 + 3.40 + 6.50	1.61 + 2.18 + 2.18 + 4.19 3.0-11.4	10.20	2700 540-3020	12.40 - 11.86	11.36	3.78
11.			8.50	2390 (550-3260)	11.0 - 10.5 - 10.1	3.56	14.50	2.50 + 3.40 + 4.30 + 4.30	1.76 + 2.40 + 3.03 + 3.03 3.0-11.4	10.20	2700 540-3020	12.40 - 11.86	11.36	3.78
12.	1.8 + 2.5 + 3.5 + 5.0	1.23 + 1.65 + 2.31 + 3.30 (2.90-9.90)	8.50	2390 (550-3260)	11.0 - 10.5 - 10.1	3.56	16.70	2.50 + 3.40 + 4.30 + 6.50	1.53 + 2.07 + 2.62 + 3.95 3.0-11.4	10.20	2700 540-3020	12.40 - 11.86	11.36	3.78
14.	1.8 + 2.5 + 5.0 + 5.0	(2.303.30) 1.09 + 1.47 + 2.97 + 2.97 (2.90-9.90)	8.50	2370 (550-3230)	10.9 - 10.4 - 10.0	3.59	18.90	2.50 + 3.40 + 6.50 + 6.50	1.46 + 1.96 + 3.78 + 3.78 3.0-12.1	11.00	2630 540-2890	12.08 - 11.55	11.07	4.18
12.	1.8 + 3.5 + 3.5 + 3.5	(2.30-3.30) 1.27 + 2.41 + 2.41 + 2.41 (2.90-9.90)	8.50	(550-3250) 2390 (550-3260)	11.0 - 10.5 - 10.1	3.56	15.40	2.50 + 4.30 + 4.30 + 4.30	1.66 + 2.84 + 2.84 + 2.84 3.0-11.4	10.20	2700 540-3020	12.40 - 11.86	11.36	3.78
13.		(2.90-9.90) 1.09 + 2.18 + 2.18 + 3.07 (2.90-9.90)	8.50	2390	11.0 - 10.5 - 10.1	3.56	17.60	2.50 + 4.30 + 4.30 + 6.50	3.0-11.4 1.56 + 2.71 + 2.71 + 4.05 3.0-12.1	11.00	2800	12.86 - 12.30	11.78	3.93
15.			8.50	(550-3260) 2370	10.9 - 10.4 - 10.0	3.59	19.80	2.50 + 4.30 + 6.50 + 6.50	1.39 + 2.38 + 3.62 + 3.62	11.00	540-3080 2800	12.86 - 12.30	11.78	3.93
10.		(290-9.90) 2.13 + 2.13 + 2.13 + 2.13	8.50	(550-3230) 2370	10.9 - 10.4 - 10.0	3.59	13.60	3.40 + 3.40 + 3.40 + 3.40	3.0-12.1 2.55 + 2.55 + 2.55 + 2.55	10.20	540-2890 2700	12.40 - 11.86	11.36	3.78
10.		(2.90-9.90) 1.93 + 1.93 + 1.93 + 2.69	8.50	(550-3260) 2370	10.9 - 10.4 - 10.0	3.59	14.50	3.40 + 3.40 + 3.40 + 4.30	3.0-11.4 2.39 + 2.39 + 2.39 + 3.01	10.20	540-3020 2700	12.40 - 11.86	11.36	3.78
11.		(2.90-9.90) 1.70 + 1.70 + 1.70 + 3.40	8.50	(550-3260) 2370	10.9 - 10.4 - 10.0	3.59	14.50	3.40 + 3.40 + 3.40 + 6.50	3.0-11.4 2.12 + 2.12 + 2.12 + 4.05	10.40	540-3020 2700	12.40 - 11.86	11.36	3,85
12.		(2.90-9.90)		(550-3260) 2370	10.9 - 10.4 - 10.0	3.59	16.70	2.50 + 3.40 + 4.30 + 4.30	3.0-11.6 1.76 + 2.39 + 3.01 + 3.01	10.20	540-3010 2700	12.40 - 11.86	11.36	3.78
12.	,	(2.90-9.90) 1.57 + 1.57 + 2.20 + 3.15	8.50	(550-3260)	10.9 - 10.4 - 10.0	3.59	14.50	3.40 + 3.40 + 4.30 + 6.50	3.0-11.4 2.01 + 2.01 + 2.54 + 3.84	10.40	540-3020 2700	12.40 - 11.86	11.36	3,85
10.	,	(2.90-9.90) 142 + 142 + 2.83 + 2.83	8,50	(550-3260) 2370	10.9 - 10.4 - 10.0	0.00	11.00	3.40 + 3.40 + 6.50 + 6.50	3.0-11.6 1.89 + 1.89 + 3.61 + 3.61		540-3010 2630	12.40 - 11.55	11.07	4,18
15.	,	1.42 + 1.42 + 2.83 + 2.83 (2.90-9.90) 1.64 + 2.29 + 2.29 + 2.29	8.50	2370 (550-3230) 2390	10.9 - 10.4 - 10.0	3.59	19.80	3.40 + 3.40 + 6.50 + 6.50 3.40 + 4.30 + 4.30 + 4.30	1.89 + 1.89 + 3.61 + 3.61 3.0-12.1 2.17 + 2.74 + 2.74 + 2.74	11.00 10.40	2630 540-2890 2700	12.08 - 11.55	11.07	4.18
13.	,	(2.90-9.90)	8.50	(550-3260)		3.56	16.30		3.0-11.6		540-3010			
14.		1.48 + 2.05 + 2.05 + 2.93 (2.90-9.90)	8.50	2390 (550-3260)	11.0 - 10.5 - 10.1	3.56	18.50	3.40 + 4.30 + 4.30 + 6.50	30-121	11.00	2630 540-2890	12.08 - 11.55	11.07	4.18
14.		2.13 + 2.13 + 2.13 + 2.13 (2.90-9.90)	8.50	2390 (550-3260)	11.0 - 10.5 - 10.1	3.56	17.20	4.30 + 4.30 + 4.30 + 4.30	2.75 + 2.75 + 2.75 + 2.75 3.0-12.1	11.00	2630 540-2890	12.08 - 11.55	11.07	4.18
15.	3.5 + 3.5 + 3.5 + 5.0	1.92 + 1.92 + 1.92 + 2.74 (2.90-9.90)	8.50	2390 (550-3260)	11.0 - 10.5 - 10.1	3.56	19.40	4.30 + 4.30 + 4.30 + 6.50	2.44 + 2.44 + 2.44 + 3.69 3.0-12.1	11.00	2630 540-2890	12.08 - 11.55	11.07	4.18
		• • •							n					

7,5,5 7,8,8 8,5 9,5 11,0,0,1 8,4 11,3,4 10,5 12,0 11,5,1 13,0,0 14,2 14,2 14,2 14,2 14,2 14,2 14,2 14,2	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	7.80 8.50 1 8.50 2	(600-28124) 165(0)-2220) 165(0)-2220) 165(0)-2220) 160(0)-2230 1600-2352) 1600-2352) 1600-2686) 1600-2686 1600-2686 1600-2686 1600-2686 1600-2686 1600-2686 1600-2686 1600-2686 1700-2866 1700-2	8.5 - 8.1 - 7.8 9.0 - 8.6 - 8.2 11.3 - 11.4 - 8.2 11.4 - 11.6 - 10.2 10.0 - 10.5 - 10.1 9.0 - 8.6 - 8.2 10.1 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 10.0 - 0.6.5 - 8.2 11.4 - 10.5 -<	4.24 4.22 4.36 3.56 4.13 3.86 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.5	10.00 10.50 11.40 12.30 14.50 11.00 12.80 13.70 12.80 13.70 14.60 14.60	200 + 200 +<	$\begin{array}{c} (3.49-10.5) \\ (3.49-10.5) \\ (3.40,115$	10.00 10.50 11.00 11.00 11.00 11.00 11.00 11.00 11.00 11.00 11.00 11.00	(610-2832) 2400 (610-2852) 2460 (610-2852) 2460 (610-2852) 2460 (610-2852) 2460 (610-2852) 2460 (610-2852) 2460 (610-2852) 2460 (610-2852) 2460 (610-2852) 2460 (610-2852)	10.84 - 10.36 11.02 - 10.54 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80	9.93 10.10 10.35 10.35 10.35 10.35 10.35 10.35 10.35 10.35 10.35 10.35	4.45 4.58 4.47 4.47 4.47 4.47 4.47 4.47 4.47 4.4
8.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9.5 9	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	8.50 2 8.50 2	1950 (600-2340) 2860 (600-2350) (600-2868) (900-2868) (900-2852) 2800 (600-2853) 2800 (600-2868) 2800 (600-2800) 2800 (600-2800) 2800 (600-2800) 2800 (600-2800) 2800 (600-280	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.28 3.56 4.13 3.86 3.56 3.56 3.56 3.56 3.56 3.56 3.56 3.5	12.30 14.50 11.00 11.90 12.80 15.00 12.80 13.70 15.90 14.60 16.80	200 + 200 + 200 + 200 + 4.30 200 + 200 + 200 + 200 + 650 200 + 200 + 200 + 200 + 650 200 + 200 + 200 + 250 + 450 200 + 200 + 200 + 250 + 430 200 + 200 + 200 + 250 + 430 200 + 200 + 200 + 250 + 430 200 + 200 + 200 + 250 + 430 200 + 200 + 200 + 340 + 450 200 + 200 + 200 + 340 + 560 200 +	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	11.00 11.00 11.00 11.00 11.00 11.00 11.00 11.00	2400 (§10-2880) (§10-2952) 2460 (§10-2952) 2460 (§10-2952) 2460 (§10-2952) 2460 (§10-2952) 2460 (§10-2952) 2460 (§10-2952) 2460 (§10-2952) 2460 (§10-2952) 2460 (§10-2952)	11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80	10.35 10.35 10.35 10.35 10.35 10.35 10.35 10.35 10.35	4.47 4.47 4.47 4.47 4.47 4.47 4.47 4.47
11.0.1 8.1 9.8 9.8 9.8 9.8 9.8 9.8 9.8 9.8 10.5 5 10.5 5 10.5 5 10.5 10.5 10.5 10.	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	8.50 2 8.50 2	2590 (600-3106) 2393 (600-2856) 1960 (600-2856) 2000 (600-2856) 2000 (600-2866) 2000 (600-286) 2000 (600-2866) 2000 (600-2866)	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.56 4.13 3.86 3.56 3.43 3.56 3.56 3.56 3.56 3.56 3.56	14.50 11.00 11.90 12.80 15.00 12.80 13.70 13.70 14.60 16.80	200 + 200 + 200 + 200 + 200 + 6.50 2.00 + 2.00 + 2.00 + 2.50 + 2.50 2.00 + 2.00 + 2.00 + 2.50 + 2.50 2.00 + 2.00 + 2.00 + 2.00 + 2.50 2.00 + 2.00 + 2.00 + 2.00 + 3.60 2.00 + 2.00 + 2.00 + 3.60 + 3.60 2.00 + 2.00 + 2.00 + 3.40 + 4.60 2.00 + 2.00 + 3.00 + 3.40 + 4.60 2.00 + 2.00 + 3.40 + 5.80 2.00 + 2.00 + 2.00 + 3.40 + 5.80 <	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	11.00 11.00 11.00 11.00 11.00 11.00 11.00 11.00	2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952)	11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80	10.35 10.35 10.35 10.35 10.35 10.35 10.35 10.35	4.47 4.47 4.47 4.47 4.47 4.47 4.47 4.47
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8.8 9.8 9.5 11.3 9.5 12.0 11.5 12.0 11.5 12.0 11.5 13.0 11.5 8.4 9.8 8.4 9.1 11.6 8.4 9.8 8.4 10.8 11.6 9.8 8.4 11.3 9.7 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	8.50 2 8.50 2	(600-2352) 2200 (600-2644) 2390 (600-2668) 239	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.86 3.56 3.43 3.56 3.56 3.56 3.56 3.56 3.56	11.90 12.80 15.00 12.80 13.70 15.90 14.60 16.80	200 + 2.00 + 2.00 + 3.40 2.00 + 2.00 + 2.00 + 2.00 + 3.40 2.00 + 2.00 + 2.00 + 2.00 + 3.40 2.00 + 2.00 + 2.00 + 2.00 + 3.40 2.00 + 2.00 + 2.00 + 3.40 + 3.40 2.00 + 2.00 + 2.00 + 3.40 + 4.50 2.00 + 2.00 + 2.00 + 3.40 + 5.50 2.00 + 2.00 + 2.00 + 4.30 + 5.60 2.00 + 2.00 + 2.00 + 4.30 + 5.60	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	11.00 11.00 11.00 11.00 11.00 11.00	2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952)	11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80	10.35 10.35 10.35 10.35 10.35 10.35 10.35	
9.8 11.3 9.5 10.5 12.0 11.5 13.0 14.5 8.4 9.1 10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 13.3 14.8	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccc} (1,2,2,0) & 0,00 \\ (1,2,0) & 1,30 \\ (1,3,0) $	8.50 2 8.50 2	(600-2640) 2390 (600-2868) 2390 (600-2868) 2440 (600-2868) 239	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.56 3.43 3.56 3.56 3.56 3.56 3.56 3.56	12.80 15.00 12.80 13.70 15.90 14.60 16.80	200 + 200 + 2.00 + 2.00 + 2.00 + 2.00 + 2.00 + 2.00 + 2.00 + 2.00 + 2.00 + 2.00 + 2.00 + 3.00	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	11.00 11.00 11.00 11.00 11.00 11.00	(610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952)	11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80 11.29 - 10.80	10.35 10.35 10.35 10.35	
11.3 9.5 10.5 12.0 11.5 13.0 14.5 8.4 9.1 10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 13.3 14.8	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2	(600-2868) 2390 (600-2868) 2480 (600-2868) 2390 (600-2868) 2390 (600-2868) 2390 (600-2868) 2390 (600-2868) 2180 (600-2868) 2490 (600-2868) 2390 (600-2868) 2390	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.56 3.43 3.56 3.56 3.56 3.56 3.56	15.00 12.80 13.70 15.90 14.60 16.80	2.00 + 2.00 + 2.00 + 4.30 + 4.30	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	11.00 11.00 11.00 11.00 11.00	(610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952)	11.29 - 10.80 11.29 - 10.80	10.35 10.35 10.35 10.35	
9.5 10.5 12.0 11.5 13.0 14.5 8.4 9.1 10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2	2490 (600-2976) 2390 (600-2968) 2390 (600-2868) 2390 (600-2868) 2390 (600-2868) 2190 (600-2868) 2190 (600-2868) 2390 (600-2868) 2390	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3.43 3.56 3.56 3.56 3.56 3.56	12.80 13.70 15.90 14.60 16.80	2.00 + 2.00 + 2.00 + 4.30 + 4.30	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	11.00 11.00 11.00 11.00	2460 (610-2952) 2460 (610-2952) 2460 (610-2952) 2460 (610-2952)	11.29 - 10.80 11.29 - 10.80	10.35 10.35 10.35 10.35	
10.5 12.0 11.5 13.0 14.5 8.4 9.1 10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 13.3 14.8 10.5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccc} (a,20) & -9.00 \\ (a,12) & -1.21 & +1.21 & +1.21 & +2.02 & +2.83 \\ (a,12) & -1.21 & +1.21 & +2.02 & +2.83 \\ (a,12) & -9.00 & -1.05 & +1.77 & +3.54 \\ (b,23) & -9.00 & -1.05 & +1.77 & +3.54 \\ (b,23) & -9.00 & -1.05 & +2.29 & +3.27 \\ (b,23) & -9.00 & -0.08 & +2.29 & +3.27 \\ (b,23) & -9.00 & -0.08 & +2.29 & +3.27 \\ (b,23) & -9.00 & -0.08 & +2.69 & +2.93 \\ (b,23) & -9.00 & -0.08 & +2.69 & +2.93 \\ (b,23) & -9.00 & -1.06 & +1.60 & +1.60 \\ (b,23) & -9.00 & -1.06 & +1.60 & +1.60 \\ (b,23) & -1.00 & +1.60 & +1.60 & +1.60 \\ (b,23) & -1.00 & +1.60 & +1.60 & +1.60 \\ (b,23) & -1.00 & +1.51 & +1.51 & +2.54 \\ (b,23) & -1.00 & +1.51 & +1.51 & +2.54 \\ (b,23) & -1.00 & +1.55 & +1.71 & +2.71 \\ (b,23) & -1.00 & +1.55 & +2.17 & +2.17 \\ (b,23) & -1.00 & +1.55 & +2.17 & +2.17 \\ (b,23) & -1.00 & +1.55 & +2.17 & +2.71 \\ (b,23) & -1.00 & +1.55 & +2.17 & +2.71 \\ (b,23) & -1.00 & +1.55 & +2.17 & +2.71 \\ (b,24) & -1.00 & +1.54 & +1.74 & +1.97 & +2.75 \\ (b,24) & -1.00 & +1.24 & +1.97 & +2.75 \\ (b,26) & -1.00 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.00 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.00 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.00 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.00 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.00 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.00 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.00 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.00 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.04 & +1.24 & +1.77 & +3.46 \\ (b,26) & -1.04 & +1.04 & +1.04 & +1.04 & +1.04 \\ (b,26) & -1.04 & +1.04 & +1.04 & +1.04 \\ (b,26) &$	8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2	(600-2976) (600-2868) (600-2868) 2390 (600-2868) 2391 (600-2868) 2390 (600-2868) 2390 (600-2868) 2490 (600-2868) 2390 (600-2868) 2390	11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 10.0 - 9.6 - 9.2 11.4 - 10.9 - 10.5	3.56 3.56 3.56 3.56 3.56	13.70 15.90 14.60 16.80	2.00 + 2.00 + 2.00 + 4.30 + 4.30	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	11.00 11.00 11.00	2460 (610-2952) 2460 (610-2952) 2460 (610-2952)	11.29 - 10.80 11.29 - 10.80	10.35 10.35	
12.0 11.5 13.0 14.5 8.4 9.1 10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2	2390 (600-2868) 2390 (600-2868) 2390 (600-2868) 2390 (600-2868) 2180 (600-2868) 2490 (600-2868) 2390	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3.56 3.56 3.56 3.56	15.90 14.60 16.80	2.00 + 2.00 + 2.00 + 4.30 + 4.30	1.38 + 1.38 + 1.38 + 2.35 + 4.50 (3.40-11.5) 1.51 + 1.51 + 1.51 + 3.24 + 3.24 (3.40-11.5)	11.00 11.00	2460 (610-2952) 2460 (610-2952)	11.29 - 10.80	10.35	
11.5 13.0 14.5 8.4 9.1 10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	8.50 2 8.50 2 8.50 2 8.40 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2	2390 (600-2868) 2390 (600-2868) 2390 (600-2868) 2180 (600-2868) 2390 (600-2868) 2390	11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1 10.0 - 9.6 - 9.2 11.4 - 10.9 - 10.5	3.56 3.56 3.56	14.60 16.80		1.51 + 1.51 + 1.51 + 3.24 + 3.24 (3.40-11.5)	11.00	2460 (610-2952)			
13.0 14.5 8.4 9.1 10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	8.50 2 8.50 2 8.40 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2	2390 (600-2868) (600-2868) 2180 (600-2816) 2490 (600-2988) 2390 (600-2988) 2390	11.0 - 10.5 - 10.1 10.0 - 9.6 - 9.2 11.4 - 10.9 - 10.5	3.56 3.56	16.80	2.00 + 2.00 + 2.00 + 4.30 + 6.50	(3.40-11.5)			44.00 40.00	10.35	4.47
8.4 9.1 10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	8.50 2 8.50 2 8.50 2 8.50 2 8.50 2 8.50 2	2390 (600-2868) 2180 (600-2616) 2490 (600-2988) 2390 (600-2868) 2390	10.0 9.6 9.2 11.4 10.9 10.5				1.31 + 1.31 + 1.31 + 2.82 + 4.26 (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.60		+r
9.1 10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	8.40 8.50 8.50 8.50 2 8.50 2 8.50 2 8.50	2180 (600-2616) 2490 (600-2988) 2390 (600-2868) 2390	11.4 - 10.9 - 10.5	3.85	19.00	2.00 + 2.00 + 2.00 + 6.50 + 6.50	(3.40-11.5) 1.16 + 1.16 + 1.16 + 3.76 + 3.76 (3.40-11.5)	11.00		11.29 - 10.80	10.35	4.47
10.1 11.6 9.8 10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	8.50 ² 8.50 ² 8.50 ²	2490 (600-2988) 2390 (600-2868) 2390			11.50	2.00 + 2.00 + 2.50 + 2.50 + 2.50	(3.40-11.5) (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
11.6 9.8 10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{c} 1.5 + 1.5 + 1.8 + 2.5 + 2.5 \\ 1.5 + 1.5 + 1.8 + 2.5 + 3.5 \\ 1.5 + 1.5 + 1.8 + 2.5 + 5.0 \\ 1.5 + 1.5 + 1.8 + 3.5 + 3.5 \\ 1.5 + 1.5 + 1.8 + 3.5 + 5.0 \end{array}$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	8.50 ² 8.50 ²	2390 (600-2868) 2390	11.0 - 10.5 - 10.1	3.41	12.40	2.00 + 2.00 + 2.50 + 2.50 + 3.40	1.77 + 1.77 + 2.22 + 2.22 + 3.02 (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
9.8 10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{c} 1.5 + 1.5 + 1.8 + 2.5 + 2.5 \\ 1.5 + 1.5 + 1.8 + 2.5 + 3.5 \\ 1.5 + 1.5 + 1.8 + 2.5 + 5.0 \\ 1.5 + 1.5 + 1.8 + 3.5 + 3.5 \\ 1.5 + 1.5 + 1.8 + 3.5 + 5.0 \end{array}$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	8.50 ²			3.56	13.30	2.00 + 2.00 + 2.50 + 2.50 + 4.30	1.65 + 1.65 + 2.07 + 2.07 + 3.56 (3.40-11.5)	11.00	(610-2952)	11.29 - 10.80	10.35	4.47
10.8 12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$			11.0 - 10.5 - 10.1	3.56	15.50	2.00 + 2.00 + 2.50 + 2.50 + 6.50	1.42 + 1.42 + 1.77 + 1.77 + 4.61 (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
12.3 11.8 13.3 14.8 10.5 11.5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	(3.20 - 9.00) 0 (3.44 + 1.04 + 1.24 + 1.73 + 3.46 (3.20 - 9.00) 5 108 + 108 + 130 + 2.52 + 2.52	8.50	2390 (600-2868) 2390	11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1	3.56	13.30	2.00 + 2.00 + 2.50 + 3.40 + 3.40	1.65 + 1.65 + 2.07 + 2.81 + 2.81 (3.40-11.5) 1.55 + 1.55 + 1.94 + 2.63 + 3.33	11.00	2460 (610-2952) 2460	11.29 - 10.80	10.35	4.47
11.8 13.3 14.8 10.5 11.5	1.5 + 1.5 + 1.6 + 3.5 + 3.5 1.5 + 1.5 + 1.8 + 3.5 + 3.5 1.5 + 1.5 + 1.8 + 3.5 + 5.0 1.5 + 1.5 + 1.8 + 3.5 + 5.0 1.5 + 1.5 + 1.8 + 5.0 + 5.0	(3.20 - 9.00) 5 1.08 + 1.08 + 1.30 + 2.52 + 2.52	2	(600-2868) 2390	11.0 - 10.5 - 10.1	3.56	14.20	200 + 200 + 250 + 340 + 450	(3.40-11.5)	11.00	(610-2952) 2460	11.29 - 10.80	10.35	4.47
13.3 14.8 10.5 11.5	1.5 + 1.5 + 1.8 + 3.5 + 5.0 1.5 + 1.5 + 1.8 + 5.0 + 5.0		8.50	(600-2868)	11.0 - 10.5 - 10.1	3.56	16.40	2.00 + 2.00 + 2.50 + 4.30 + 4.30	(3.40-11.5) 1.46 + 1.46 + 1.82 + 3.13 + 3.13	11.00	(610-2952)	11.29 - 10.80	10.35	4.47
14.8 10.5 11.5	1.5 + 1.5 + 1.8 + 5.0 + 5.0	(3.20 9.00) 0.96 + 0.96 + 1.15 + 2.24 + 3.20	8.50 ² 8.50 ²	(600-2868) 2390	11.0 - 10.5 - 10.1	3.56 3.56	15.10 17.30	2.00 + 2.00 + 2.50 + 4.30 + 6.50	(3.40-11.5) 1.27 + 1.27 + 1.59 + 2.73 + 4.13	11.00	(610-2952) 2460	11.29 - 10.80	10.35	4.47
10.5		(3.20 - 9.00) 0 0.86 + 0.86 + 1.03 + 2.87 + 2.87 0 0.00 + 0.00 + 1.03 + 2.87 + 2.87		(600-2868) 2390	11.0 - 10.5 - 10.1	3.56	17.30	2.00 + 2.00 + 2.50 + 6.50 + 6.50	(3.40-11.5) 1.13 + 1.13 + 1.41 + 3.67 + 3.67 1.13 + 1.13 + 1.41 + 3.67 + 3.67	11.00		11.29 - 10.80	10.35	4.47
	1.5 + 1.5 + 2.5 + 2.5 + 2.5	(3.20 - 9.00) 5 1.21 + 1.21 + 2.02 + 2.02 + 2.02 (3.20 - 9.00)		(600-2868) 2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	14.20	2.00 + 2.00 + 3.40 + 3.40 + 3.40	(3.40-11.5) 1.55 + 1.55 + 2.63 + 2.63 + 2.63 (3.40-11.5)	11.00	(610-2952) 2460 (610-2952)	11.29 - 10.80	10.35	4.47
13.0	1.5 + 1.5 + 2.5 + 2.5 + 3.5	(3.20 9.00) 5 1.11 + 1.11 + 1.85 + 1.85 + 2.59 (3.20 9.00)		(600-2868) 2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	15.10	2.00 + 2.00 + 3.40 + 3.40 + 4.30	(3.40-11.5) 1.46 + 1.46 + 2.48 + 2.48 + 3.13 (3.40-11.5)	11.00		11.29 - 10.80	10.35	4.47
	1.5 + 1.5 + 2.5 + 2.5 + 5.0	(3.20 - 9.00) 0 0.98 + 0.98 + 1.63 + 1.63 + 3.27 (3.20 - 9.00)	8.50 2	(600-2868) 2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	17.30	2.00 + 2.00 + 3.40 + 3.40 + 6.50	(3.40-11.5) 1.27 + 1.27 + 2.16 + 2.16 + 4.13 (3.40-11.5)	11.00		11.29 - 10.80	10.35	4.47
12.5	1.5 + 1.5 + 2.5 + 3.5 + 3.5	5 1.02 + 1.02 + 1.70 + 2.38 + 2.38 (3.20 - 9.00)	8.50 2	2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	16.00	2.00 + 2.00 + 3.40 + 4.30 + 4.30	1.38 + 1.38 + 2.34 + 2.96 + 2.96 (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
14.0	1.5 + 1.5 + 2.5 + 3.5 + 5.0	0 0.91 + 0.91 + 1.52 + 2.13 + 3.04 (3.20 - 9.00)	8.50 2	2390 (600-2868)	11.0 10.5 10.1	3.56	18.20	2.00 + 2.00 + 3.40 + 4.30 + 6.50	1.21 + 1.21 + 2.05 + 2.60 + 3.93 (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
15.5	1.5 + 1.5 + 2.5 + 5.0 + 5.0	0 0.82 + 0.82 + 1.37 + 2.74 + 2.74 (3.20 - 9.00)	8.50 2	2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	20.40	2.00 + 2.00 + 3.40 + 6.50 + 6.50	1.08 + 1.08 + 1.83 + 3.50 + 3.50 (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
13.5	1.5 + 1.5 + 3.5 + 3.5 + 3.5	5 0.94 + 0.94 + 2.20 + 2.20 + 2.20 (3.20 - 9.00) 0 0.85 + 0.85 + 1.98 + 1.98 + 2.83	8.50	2390 (600-2868) 2300	11.0 - 10.5 - 10.1 11.0 - 10.5 - 10.1	3.56	16.90	2.00 + 2.00 + 4.30 + 4.30 + 4.30	1.30 + 1.30 + 2.80 + 2.80 + 2.80 (3.40-11.5) 1.15 + 1.15 + 2.48 + 2.48 + 3.74	11.00	2460 (610-2952) 2460	11.29 - 10.80	10.35	4.47
15.0	15 + 18 + 18 + 18 + 18	(3.20 - 9.00) 8 1.47 + 1.76 + 1.76 + 1.76 + 1.76	8.50 2	(600-2868)	11.6 - 11.1 - 10.6	3.56	19.10	200 + 250 + 250 + 250 + 250	(3.40-11.5) 1.83 + 2.29 + 2.29 + 2.29 + 2.29	11.00	(610-2952)	11.29 - 10.80	10.35	4.47
8.7	1.5 + 1.8 + 1.8 + 1.8 + 2.5	(3.20 - 9.00) 5 1.36 + 1.63 + 1.63 + 1.63 + 2.26	8.50 ² 8.50 ²	(600-3036) 2390	11.0 - 10.5 - 10.1	3.36 3.56	12.00 12.90	2.00 + 2.50 + 2.50 + 2.50 + 3.40	(3.40-11.5) 1.71 + 2.13 + 2.13 + 2.13 + 2.90	11.00 11.00	(610-2952) 2460	11.29 - 10.80	10.35	4.47
10.4	1.5 + 1.8 + 1.8 + 1.8 + 3.5	(3.20 9.00) 5 1.23 + 1.47 + 1.47 + 1.47 + 2.86		(600-2868) 2390	11.0 10.5 10.1	3.56	12.90	2.00 + 2.50 + 2.50 + 2.50 + 4.30	(3.40-11.5) 1.59 + 1.99 + 1.99 + 1.99 + 3.43	11.00	(610-2952) 2460	11.29 - 10.80	10.35	4.47
11.9	1.5 + 1.8 + 1.8 + 1.8 + 5.0	(3.20 9.00) 0 1.07 + 1.29 + 1.29 + 1.29 + 3.57		(600-2868) 2390	11.0 - 10.5 - 10.1	3.56	16.00	2.00 + 2.50 + 2.50 + 2.50 + 6.50	(3.40-11.5) 1.38 + 1.72 + 1.72 + 1.72 + 4.47	11.00		11.29 - 10.80	10.35	4.47
SL 10.1	1.5 + 1.8 + 1.8 + 2.5 + 2.5	(3.20 - 9.00) 5 1.26 + 1.51 + 1.51 + 2.10 + 2.10 (3.20 - 9.00)		(600-2868) 2390 (600-2868)	11.0 10.5 10.1	3.56	13.80	2.00 + 2.50 + 2.50 + 3.40 + 3.40	(3.40-11.5) 1.59 + 1.99 + 1.99 + 2.71 + 2.71 (3.40-11.5)	11.00	(610-2952) 2460 (610-2952)	11.29 - 10.80	10.35	4.47
ID.1 ID.1 ID.1	1.5 + 1.8 + 1.8 + 2.5 + 3.5	5 1.15 + 1.38 + 1.38 + 1.91 + 2.68	8.50 2	(600-2868) 2390 (600-2868)	11.0 10.5 10.1	3.56	14.70	2.00 + 2.50 + 2.50 + 3.40 + 4.30	(3.40-11.5) 1.50 + 1.87 + 1.87 + 2.54 + 3.22 (3.40-11.5)	11.00		11.29 - 10.80	10.35	4.47
11.1 12.6	1.5 + 1.8 + 1.8 + 2.5 + 5.0	(3.20 - 9.00) 0 1.01 + 1.21 + 1.21 + 1.69 + 3.37 (3.20 - 9.00)	8.50 2	2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	16.90	2.00 + 2.50 + 2.50 + 3.40 + 6.50	(3.40-1.5) (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
12.1	1.5 + 1.8 + 1.8 + 3.5 + 3.5	5 1.05 + 1.26 + 1.26 + 2.46 + 2.46 (3.20 - 9.00) 0 0.94 + 1.13 + 1.13 + 2.19 + 3.13	8.50 2	2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	15.60	2.00 + 2.50 + 2.50 + 4.30 + 4.30	1.41 + 1.76 + 1.76 + 3.03 + 3.03 (3.40-11.5)	11.00		11.29 - 10.80	10.35	4.47
13.6	1.5 + 1.8 + 1.8 + 3.5 + 5.0	(3.20 - 9.00)	8.50	2390 (600-2868)	11.0 10.5 10.1	3.56	17.80	2.00 + 2.50 + 2.50 + 4.30 + 6.50	1.24 + 1.54 + 1.54 + 2.66 + 4.02 (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
15.1	1.5 + 1.8 + 1.8 + 5.0 + 5.0	0 0.84 + 1.01 + 1.01 + 2.81 + 2.81 (3.20 - 9.00)	6.50	2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	20.00	2.00 + 2.50 + 2.50 + 6.50 + 6.50	1.10 + 1.38 + 1.38 + 3.58 + 3.58 (3.40-11.5) 1.50 + 1.87 + 2.54 + 2.54 + 2.54	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
10.8	15 + 18 + 25 + 25 + 35	(3.20 9.00) 5 1.08 + 1.30 + 1.80 + 1.80 + 2.52	8.50 2	(600-2868)	11.0 - 10.5 - 10.1	3.56	14.70	200 + 250 + 340 + 340 + 430	(3.40-11.5) 1.41 + 1.76 + 2.40 + 2.40 + 3.03	11.00	(610-2952)	11.29 - 10.60	10.35	4.47
11.8	1.5 + 1.8 + 2.5 + 2.5 + 5.0	(3.20 - 9.00) 0 0.96 + 1.15 + 1.60 + 1.60 + 3.20	8.50 ² 8.50 ²	(600-2868) 2390	11.0 10.5 10.1	3.56 3.56	15.60 17.80	2.00 + 2.50 + 3.40 + 3.40 + 6.50	(3.40-11.5) 1.24 + 1.54 + 2.10 + 2.10 + 4.02	11.00	(610-2952) 2460	11.29 - 10.80	10.35	4.47
12.8	1.5 + 1.8 + 2.5 + 3.5 + 3.5	(3.20 - 9.00) 5 1.00 + 1.20 + 1.66 + 2.32 + 2.32		(600-2868) 2390	11.0 - 10.5 - 10.1	3.56	16.50	2.00 + 2.50 + 3.40 + 4.30 + 4.30	(3.40-11.5) 1.33 + 1.67 + 2.27 + 2.87 + 2.87	11.00	(610-2952) 2460	11.29 - 10.80	10.35	4.47
14.3	1.5 + 1.8 + 2.5 + 3.5 + 5.0	(3.20 - 9.00) 0 0.89 + 1.07 + 1.49 + 2.08 + 2.97 (3.20 - 9.00)		(600-2868) 2390	11.0 - 10.5 - 10.1	3.56	18.70	2.00 + 2.50 + 3.40 + 4.30 + 6.50	(3.40-11.5) 1.18 + 1.47 + 2.00 + 2.53 + 3.82 (3.40-11.5)	11.00		11.29 - 10.80	10.35	4,47
13.8	1.5 + 1.8 + 3.5 + 3.5 + 3.5	(3.20 - 9.00) 5 0.92 + 1.11 + 2.16 + 2.16 + 2.16 (3.20 - 9.00)	8.50 2	(600-2868) 2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	17.40	2.00 + 2.50 + 4.30 + 4.30 + 4.30	(3.40-11.5) 1.26 + 1.58 + 2.72 + 2.72 + 2.72 (3.40-11.5)	11.00	(610-2952) 2460 (610-2952)	11.29 - 10.80	10.35	4.47
15.3	1.5 + 1.8 + 3.5 + 3.5 + 5.0	0.83 + 1.00 + 1.94 + 1.94 + 2.78 (3.20 - 9.00)	8.50 2	2390 (600-2868)	11.0 - 10.5 - 10.1	3.56	19.60	2.00 + 2.50 + 4.30 + 4.30 + 6.50	1.12 + 1.40 + 2.41 + 2.41 + 3.65 (3.40-11.5)	11.00	2460 (610-2952)	11.29 - 10.80	10.35	4.47
9.0	1.8 + 1.8 + 1.8 + 1.8 + 1.8	8 1.70 + 1.70 + 1.70 + 1.70 + 1.70 (3.20-9.90)	8.50 2	2230 (600-3040)	10.2 9.8 9.4	3.81	12.50	2.50 + 2.50 + 2.50 + 2.50 + 2.50	2.20 + 2.20 + 2.20 + 2.20 + 2.20 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47
9.7	1.8 + 1.8 + 1.8 + 1.8 + 2.5	5 1.58 + 1.58 + 1.58 + 1.58 + 2.19 (3.20-9.90)	6.50	2230 (600-3040)	10.2 9.8 9.4	3.81	13.40	2.50 + 2.50 + 2.50 + 2.50 + 3.40	2.05 + 2.05 + 2.05 + 2.05 + 2.79 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47
10.7	1.0 + 1.8 + 1.8 + 1.8 + 3.5	5 1.43 + 1.43 + 1.43 + 1.43 + 2.80 (3.20-9.90) 0 1.25 + 1.25 + 1.25 + 1.25 + 3.47	0.00	2230 (600-3040) 2230	10.2 - 9.8 - 9.4	3.81	14.30	2.50 + 2.50 + 2.50 + 2.50 + 4.30 2.50 + 2.50 + 2.50 + 2.50 + 6.50	1.92 + 1.92 + 1.92 + 1.92 + 3.33 (3.40-12.10) 1.67 + 1.67 + 1.67 + 1.67 + 4.32	11.00	(610-2710)	11.29 - 10.80	10.35	4.47
12.2	1.8 + 1.8 + 1.8 + 2.5 + 25	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	8.30	2230 (600-3040) 2230	10.2 9.8 9.4	3.81	16.50	2.50 + 2.50 + 2.50 + 3.40 + 3.40	1.67 + 1.67 + 1.67 + 1.67 + 4.32 (3.40-12.10) 1.92 + 1.92 + 1.92 + 2.62 + 2.62	11.00	2460 (610-2710) 2460	11.29 - 10.80	10.35	4.47
10.4	1.8 + 1.8 + 1.8 + 2.5 + 3.5	(3.20-9.90) 5 1.34 + 1.34 + 1.34 + 1.86 + 2.62	0.30	(600-3040) 2230	10.2 9.8 9.4	3.81 3.81	14.30 15.20	2.50 + 2.50 + 2.50 + 3.40 + 4.30	(3.40-12.10) 1.81 + 1.81 + 1.81 + 2.46 + 3.12	11.00	(610-2710) 2460	11.29 - 10.80	10.35	4.47
11.4	1.8 + 1.8 + 1.8 + 2.5 + 5.0	(3.20-9.90) 0 1.19 + 1.19 + 1.19 + 1.65 + 3.28	8.50	(600-3040) 2230	10.2 9.8 9.4	3.81	15.20	2.50 + 2.50 + 2.50 + 3.40 + 6.50	(3.40-12.10) 1.58 + 1.58 + 1.58 + 2.15 + 4.10	11.00	(610-2710) 2460	11.29 - 10.80	10.35	4.47
12.0	1.8 + 1.8 + 1.8 + 3.5 + 3.5	(3.20-9.90) 5 1.22 + 1.22 + 1.22 + 2.41 + 2.41 (3.20-9.90)		(600-3040) 2230 (600-3040)	10.2 9.8 9.4	3.81	16.10	2.50 + 2.50 + 2.50 + 4.30 + 4.30	(3.40-12.10) 1.71 + 1.70 + 1.70 + 2.95 + 2.95 (3.40-12.10)	11.00	(610-2710) 2460 (610-2710)	11.29 - 10.80	10.35	4.47
13.9	1.8 + 1.8 + 1.8 + 3.5 + 5.0	(3.20-9.90) 0 1.10 + 1.10 + 1.10 + 2.14 + 3.04 (3.20-9.90)		(600-3040) 2230 (600-3040)	10.2 - 9.8 - 9.4	3.81	18.30	2.50 + 2.50 + 2.50 + 4.30 + 6.50	(3.40-12.10) 1.50 + 1.50 + 1.50 + 2.58 + 3.89 (3.40-12.10)	11.00	(610-2710) 2460 (610-2710)	11.29 - 10.80	10.35	4.47
15.4	1.8 + 1.8 + 1.8 + 5.0 + 5.0	(3.20-9.90) 1.00 + 1.00 + 1.00 + 2.75 + 2.75 (3.20-9.90)		(600-3040) 2230 (600-3040)	10.2 9.8 9.4	3.81	20.50	2.50 + 2.50 + 2.50 + 6.50 + 6.50	(3.40-12.10) 1.34 + 1.34 + 1.34 + 3.49 + 3.49 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47
11,1	1.8 + 1.8 + 2.5 + 2.5 + 2.5	5 1.39 + 1.39 + 1.90 + 1.90 + 1.90 (3.20-9.90)	8.50	2230 (600-3040)	10.2 - 9.8 - 9.4	3.81	15.20	2.50 + 2.50 + 3.40 + 3.40 + 3.40	1.81 + 1.81 + 2.45 + 2.45 + 2.45 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47
12.1	1.8 + 1.8 + 2.5 + 2.5 + 3.5	5 1.26 + 1.26 + 1.76 + 1.76 + 2.46 (3.20-9.90)	8.50	2230 (600-3040)	10.2 9.8 9.4	3.81	16.10	2.50 + 2.50 + 3.40 + 3.40 + 4.30	1.71 + 1.71 + 2.32 + 2.32 + 2.94 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47
13.6	1.8 + 1.8 + 2.5 + 2.5 + 5.0	0 1.13 + 1.13 + 1.56 + 1.56 + 3.14 (3.20-9.90)	8.50	2230 (600-3040)	10.2 9.8 9.4	3.81	18.30	2.50 + 2.50 + 3.40 + 3.40 + 6.50	1.50 + 1.50 + 2.04 + 2.04 + 3.92 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47
13.1	1.8 + 1.8 + 2.5 + 3.5 + 3.5 1.8 + 1.8 + 2.5 + 3.5 + 5.0	5 1.17 + 1.17 + 1.62 + 2.27 + 2.27 (3.20-9.90) 0 1.05 + 1.05 + 1.46 + 2.04 + 2.91	8.50	2230 (600-3040)	10.2 9.8 9.4 10.2 9.8 9.4	3.81	17.00	2.50 + 2.50 + 3.40 + 4.30 + 4.30 2.50 + 2.50 + 3.40 + 4.30 + 6.50	1.62 + 1.62 + 2.20 + 2.78 + 2.78 (3.40-12.10) 1.43 + 1.43 + 1.95 + 2.46 + 3.72	11.00	(610-2710)	11.29 - 10.80 11.29 - 10.80	10.35	4.47
14.6	1.8 + 1.8 + 2.5 + 3.5 + 5.0	(3.20-9.90) 5 1 1 1 + 1 1 + 2 10 + 2 10 + 2 10	0.00	2230 (600-3040) 2230	10.2 9.8 9.4	3.81	19.20	2.50 + 2.50 + 3.40 + 4.30 + 6.50 2.50 + 2.50 + 4.30 + 4.30 + 4.30	(3.40-12.10) 1.54 + 1.56 + 2.63 + 2.63 + 2.63	11.00	(610-2710) 2460	11.29 - 10.80	10.35	4.47
14.1	1.8 + 2.5 + 2.5 + 2.5 + 2.5	(3.20-9.90) 5 1.29 + 1.80 + 1.80 + 1.80 + 1.80	8.50	(600-3040) 2230	10.2 9.8 9.4	3.81 3.81	17.90 16.10	2.50 + 3.40 + 3.40 + 3.40 + 3.40	(3.40 ^{-12.10}) 180 ± 230 ± 230 ± 230 ± 230	11.00	(610-2710) 2460	11.29 - 10.80	10.35	4.47
11.8	1.8 + 2.5 + 2.5 + 2.5 + 3.5	(3.20-9.90) 5 1.19 + 1.66 + 1.66 + 1.66 + 2.32	0.50	(600-3040) 2230	10.2 - 9.8 - 9.4	3.81	16.10 17.00	2.50 + 3.40 + 3.40 + 3.40 + 4.30	(3.40-12.10) 1.60 + 2.20 + 2.20 + 2.20 + 2.80	11.00	(610-2710) 2460	11.29 - 10.80	10.35	4.47
12.8	1.8 + 2.5 + 2.5 + 2.5 + 5.0	(3.20-9.90) 0 1.08 + 1.49 + 1.49 + 1.49 + 2.97	0.00	(600-3040) 2230	10.2 9.8 9.4	3.81	17.00	2.50 + 3.40 + 3.40 + 3.40 + 6.50	(3.40-12.10) 1.45 + 1.95 + 1.95 + 1.95 + 3.70	11.00	(610-2710) 2460	11.29 - 10.80	10.35	4.47
13.8	1.8 + 2.5 + 2.5 + 3.5 + 3.5	(3.20-9.90) 5 1.12 + 1.54 + 1.54 + 2.16 + 2.16 (3.20.0.00)		(600-3040) 2230 (600-3040)	10.2 9.8 9.4	3.81	17.90	2.50 + 3.40 + 3.40 + 4.30 + 4.30	(3.40-12.10) 1.54 + 2.09 + 2.09 + 2.64 + 2.64 (2.40.12.10)	11.00		11.29 - 10.80	10.35	4.47
15.3	1.8 + 2.5 + 2.5 + 3.5 + 5.0	(3.20-9.90) 1.00 + 1.39 + 1.39 + 1.94 + 2.78 (3.20-9.90)		(600-3040) 2230 (600-3040)	10.2 - 9.8 - 9.4	3.81	20.10	2.50 + 3.40 + 3.40 + 4.30 + 6.50	(3.40-12.10) 1.37 + 1.86 + 1.86 + 2.35 + 3.56 (3.40-12.10)	11.00	(610-2710) 2460 (610-2710)	11.29 - 10.80	10.35	4.47
14.8	1.8 + 2.5 + 3.5 + 3.5 + 3.5	5 1.03 + 1.44 + 2.01 + 2.01 + 2.01 (3.20-9.90)	8.50 2	(600-3040) 2230 (600-3040)	10.2 9.8 9.4	3.81	18.80	2.50 + 3.40 + 4.30 + 4.30 + 4.30	1.45 + 1.99 + 2.55 + 2.55 + 2.55 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47
12.5	2.5 + 2.5 + 2.5 + 2.5 + 2.5	5 1.70 + 1.70 + 1.70 + 1.70 + 1.70 (3.20-9.90)	8.50	2230 (600-3040)	10.2 - 9.8 - 9.4	3.81	17.00	3.40 + 3.40 + 3.40 + 3.40 + 3.40	2.20 + 2.20 + 2.20 + 2.20 + 2.20 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47
13.5	2.5 + 2.5 + 2.5 + 2.5 + 3.5	5 1.57 + 1.57 + 1.57 + 1.57 + 2.19 (3.20-9.90)	8.50	2230 (600-3040)	10.2 9.8 9.4	3.81	17.90	3.40 + 3.40 + 3.40 + 3.40 + 4.30	2.09 + 2.09 + 2.09 + 2.09 + 2.64 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4,47
15.0	2.5 + 2.5 + 2.5 + 2.5 + 5.0	0 1.42 + 1.42 + 1.42 + 1.42 + 2.83 (3.20-9.90)	8.50	2230 (600-3040)	10.2 9.8 9.4	3.81	20.10	3.40 + 3.40 + 3.40 + 3.40 + 6.50	1.86 + 1.86 + 1.86 + 1.86 + 3.56 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47
14.5	2.5 + 2.5 + 2.5 + 3.5 + 3.5	5 148 + 148 + 148 + 204 + 204	0.30	2230 (600-3040)	10.2 - 9.8 - 9.4	3.81	18.80	3.40 + 3.40 + 3.40 + 4.30 + 4.30 3.40 + 3.40 + 4.30 + 4.30 + 4.30	2.00 + 2.00 + 2.00 + 2.50 + 2.50 (3.40-12.10)	11.00	(610-2710)	11.29 - 10.80	10.35	4.47
15.5	2.5 + 2.5 + 3.5 + 3.5 + 3.5	(3.20-9.90) 5 1.39 + 1.39 + 1.91 + 1.91 + 1.91 (3.20-9.90)	8.50 2	2230 (600-3040)	10.2 - 9.8 - 9.4	3.81	19.70	3.40 + 3.40 + 4.30 + 4.30 + 4.30	1.90 + 1.90 + 2.40 + 2.40 + 2.40 (3.40-12.10)	11.00	2460 (610-2710)	11.29 - 10.80	10.35	4.47

Two indoor units should be connected at least.

Total nominal cooling capacity should not be more than 15.5kW.

<REMARKS>

* ONE UNIT INDICATED ARE ONLY FOR ONE UNIT OPERATION WHEN TWO OR MORE INDOOR UNITS ARE CONNECTED.

* TWO UNITS INDICATED ARE ONLY FOR TWO UNITS OPERATION WHEN TWO OR MORE INDOOR UNITS ARE CONNECTED.
 * THREE UNITS INDICATED ARE ONLY FOR THREE UNITS OPERATION WHEN THREE OR MORE INDOOR UNITS ARE CONNECTED.

* FOUR UNITS INDICATED ARE ONLY FOR FOUR UNITS OPERATION WHEN FOUR OR FIVE INDOOR UNITS ARE CONNECTED.

RATING CONDITON (DRY BLUB / WET BULB)

	INDOOR	OUTDOOR				
COOLING	27 / 19 °C	35 / 24°C				
HEATING	20 / –°C	7 / 6°C				

DUAL AND TRIPLE SYSTEM MULTI R.A.C. *RAM-90NP5B* INDOOR UNITS COMBINATIONS TO BE ABLE TO INSTALL

Two, three, four or five indoor units can be installed with one outdoor unit. And total nominal cooling capacity should not be more than 15.5kW

NOMINAL COOLING	INDOOR UNIT MODEL	CAPACI at one unit	ΓΥ (kW) : operation	SUITABLE ROOM SIZE (m ²) at one unit operation		
CAPACITY (kW)	MODEL	COOLING	HEATING	COOLING	HEATING	
1.5kW	RAK-15QPB	1.00 ~ 1.60	1.10 ~ 2.20	8~12	9~11	
	RAK-18RPB	1.50 ~ 2.00	1.80 ~ 3.50	8~12	9~11	
1.8kW	RAK-18QXB	1.50 ~ 2.00	1.80 ~ 3.50	8 ~ 12	9~11	
	RAD-18QPB	1.50 ~ 2.00	1.80 ~ 3.50	8 ~ 12	9~11	
	RAK-25RPB	1.50 ~ 2.80	1.80 ~ 4.70	11 ~ 17	14 ~ 18	
	RAK-25RXB	1.50 ~ 2.80	1.80 ~ 4.70	11 ~ 17	14 ~ 18	
2.5kW	RAD-25QPB	1.50 ~ 2.80	1.80 ~ 4.70	11 ~ 17	14 ~ 18	
	RAI-25QPB	1.50 ~ 2.80	1.80 ~ 4.70	11 ~ 17	14 ~ 18	
	RAF-25RXB	1.50 ~ 2.80	1.80 ~ 4.70	11 ~ 17	14 ~ 18	
	RAK-35RPB	1.50 ~ 3.90	1.80 ~ 5.80	16 ~ 24	17 ~ 22	
	RAK-35RXB	1.50 ~ 3.90	1.80 ~ 5.80	16 ~ 24	17 ~ 22	
3.5kW	RAD-35QPB	1.50 ~ 3.90	1.80 ~ 5.80	16 ~ 24	17 ~ 22	
	RAI-35QPB	1.50 ~ 3.90	1.80 ~ 5.80	16 ~ 24	17 ~ 22	
	RAF-35RXB	1.50 ~ 3.90	1.80 ~ 5.80	16 ~ 24	17 ~ 22	
	RAK-50RPB	1.50 ~ 5.60	1.80 ~ 7.20	23 ~ 34	23 ~ 29	
	RAK-50RXB	1.50 ~ 5.60	1.80 ~ 7.20	23 ~ 34	23 ~ 29	
5.0kW	RAD-50QPB	1.50 ~ 5.60	1.80 ~ 7.20	23 ~ 34	23 ~ 29	
	RAI-50QPB	1.50 ~ 5.60	1.80 ~ 7.20	23 ~ 34	23 ~ 29	
	RAF-50RXB	1.50 ~ 5.60	1.80 ~ 7.20	23 ~ 34	23 ~ 29	

Be sure to connect two, three or four indoor units to this outdoor unit. If not, condensed water may drop, resulting in trouble.

QUADRUPLE SYSTEM MULTI R.A.C. RAM-90NP5B INDOOR UNITS COMBINATIONS TO BE ABLE TO INSTALL

POSSIE	BLE COMBINATIONS TO INSTALL (kW)	SUITABLE ROOM SIZE TO INSTALL (m ²)	CONNECTING POSITION ON OUTDOOR UNIT (VALVE DIAMETER) (mm)						
	· · ·		No. 1 6.35/9.52D	No. 2 6.35/9.52D	No. 3 6.35/9.52D	No. 4 6.35/12.7D	No. 5 6.35/12.7D		
	1.8+1.8	(8 ~ 12) + (8 ~ 12)	1.8	1.8	0.00,0.020	3.99/14.10	3.00/12.70		
	1.8+2.5	$(8 \sim 12) + (11 \sim 17)$ $(8 \sim 12) + (16 \sim 24)$	1.8	2.5					
γ	1.8+3.5 1.8+5.0	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	<u>1.8</u> 1.8	3.5		5.0			
UNITS	1.8+6.0	(8 ~ 12) + (27 ~ 41)	1.8			6.0			
n o	2.5+2.5	$(11 \sim 17) + (11 \sim 17)$	2.5	2.5					
OWT	2.5+3.5 2.5+5.0	(<u>11</u> ~ <u>17</u>) + (<u>16</u> ~ <u>24</u>) (<u>11</u> ~ <u>17</u>) + (<u>23</u> ~ <u>34</u>)	2.5 2.5	3.5		5.0			
-	3.5+3.5	$(16 \sim 24) + (16 \sim 24)$	3.5	3.5		0.0			
	3.5+5.0	$(15 \sim 23) + (21 \sim 32)$	3.5			5.0			
	5.0+5.0 1.8+1.8+1.8	(<u>19</u> ~ <u>29</u>) + (<u>19</u> ~ <u>29</u>) (<u>8</u> ~ <u>12</u>) + (<u>8</u> ~ <u>12</u>) + (<u>8</u> ~ <u>12</u>)	1.8	1.8	1.8	5.0	5.0		
	1.8+1.8+2.5	$(8 \sim 12) + (8 \sim 12) + (11 \sim 17)$	1.8	1.8	2.5				
	1.8+1.8+3.5	$(8 \sim 12) + (8 \sim 12) + (16 \sim 24)$	1.8	1.8	3.5				
	1.8+1.8+5.0 1.8+2.5+2.5	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	<u>1.8</u> 1.8	1.8 2.5	2.5	5.0			
	1.8+2.5+3.5	$(8 \sim 12) + (11 \sim 17) + (16 \sim 24)$	1.8	2.5	3.5				
	1.8+2.5+5.0	$(8 \sim 12) + (11 \sim 17) + (22 \sim 33)$	1.8	2.5		5.0			
ITS	1.8+3.5+3.5 1.8+3.5+5.0	$ (8 \sim 12) + (16 \sim 24) + (16 \sim 24) (7 \sim 11) + (14 \sim 21) + (20 \sim 30) $	<u>1.8</u> 1.8	3.5 3.5	3.5	5.0			
N	1.8+5.0+5.0	$(6 \sim 10) + (17 \sim 26) + (17 \sim 26)$	1.8	5.5		5.0			
	2.5+2.5+2.5	(11 ~ 17) + (11 ~ 17) + (11 ~ 17)	2.5	2.5	2.5				
THREE	2.5+2.5+3.5 2.5+2.5+5.0	$(11 \sim 17) + (11 \sim 17) + (16 \sim 24)$ $(10 \sim 16) + (10 \sim 16) + (20 \sim 31)$	2.5 2.5	2.5	3.5	5.0			
	2.5+3.5+3.5	$(11 \sim 16) + (15 \sim 23) + (15 \sim 23)$	2.5	3.5	3.5	5.0			
	2.5+3.5+5.0	(9 ~ 14) + (13 ~ 20) + (19 ~ 28)	2.5	3.5		5.0			
	2.5+5.0+5.0 3.5+3.5+3.5	(8 ~ 12) + (16 ~ 25) + (16 ~ 25) (14 ~ 21) + (14 ~ 21) + (14 ~ 21)	<u>2.5</u> 3.5	3.5	3.5	5.0	5.0		
	3.5+3.5+5.0	(12 ~ 18) + (12 ~ 18) + (17 ~ 26)	3.5	3.5	0.0	5.0			
	3.5+5.0+5.0	$(10 \sim 16) + (15 \sim 23) + (15 \sim 23)$	3.5			5.0	5.0		
	5.0+5.0+5.0 1.8+1.8+1.8+1.8	(14 ~ 21) + (14 ~ 21) + (14 ~ 21) (8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12)	<u> 5.0</u>	1.8	1.8	<u>5.0</u> © 1.8	5.0		
	1.8+1.8+1.8+2.5	$(8 \sim 12) + (8 \sim 12) + (8 \sim 12) + (11 \sim 17)$	1.8	1.8	1.8	© 2.5			
	1.8+1.8+1.8+3.5	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (16 ~ 24)	1.8	1.8	1.8	© 3.5			
	1.8+1.8+1.8+5.0 1.8+1.8+2.5+2.5	$\frac{(7 \sim 11) + (7 \sim 11) + (7 \sim 11) + (20 \sim 30)}{(8 \sim 12) + (8 \sim 12) + (11 \sim 17) + (11 \sim 17) + (11 \sim 17)}$	<u>1.8</u> 1.8	<u>1.8</u> 1.8	1.8	5.0 © 2.5			
	1.8+1.8+2.5+3.5	(8 ~ 12) + (8 ~ 12) + (11 ~ 16) + (15 ~ 23)	1.8	1.8	2.5	© 3.5			
	1.8+1.8+2.5+5.0	$(7 \sim 10) + (7 \sim 10) + (9 \sim 14) + (19 \sim 28)$	1.8	1.8	2.5	5.0			
	1.8+1.8+3.5+3.5 1.8+1.8+3.5+5.0	$ (7 \sim 11) + (7 \sim 11) + (14 \sim 20) + (14 \sim 20) (6 \sim 9) + (6 \sim 9) + (12 \sim 18) + (17 \sim 26) $	<u>1.8</u> 1.8	<u>1.8</u> 1.8	3.5 3.5	© 3.5 5.0			
	1.8+1.8+5.0+5.0	$(5 \sim 8) + (5 \sim 8) + (15 \sim 23) + (15 \sim 23)$	1.8	1.8	0.0	5.0	5.0		
	1.8+2.5+2.5+2.5	$\frac{(8 \sim 12) + (11 \sim 17) + (11 \sim 17) + (11 \sim 17)}{(7 \sim 11) + (10 \sim 15) + (10 \sim 15) + (14 \sim 21)}$	1.8	2.5	2.5	© 2.5			
ITS	1.8+2.5+2.5+3.5 1.8+2.5+2.5+5.0	$(7 \sim 11) + (10 \sim 15) + (10 \sim 15) + (14 \sim 21)$ (6 \circ 10) + (9 \circ 13) + (9 \circ 13) + (17 \circ 26)	<u>1.8</u> 1.8	2.5 2.5	2.5 2.5	© 3.5 5.0			
LINU	1.8+2.5+3.5+3.5	(6 ~ 10) + (9 ~ 14) + (13 ~ 19) + (13 ~ 19)	1.8	2.5	3.5	© 3.5			
	1.8+2.5+3.5+5.0	$(6 \sim 9) + (8 \sim 12) + (11 \sim 17) + (16 \sim 24)$	1.8	2.5	3.5	5.0			
FOUR	1.8+2.5+5.0+5.0 1.8+3.5+3.5+3.5	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	<u>1.8</u> 1.8	2.5 3.5	3.5	<u>5.0</u> © 3.5	5.0		
-	1.8+3.5+3.5+5.0	(5 ~ 8) + (10 ~ 16) + (10 ~ 16) + (15 ~ 22)	1.8	3.5	3.5	5.0			
	1.8+3.5+5.0+5.0	$(5 \sim 7) + (9 \sim 14) + (13 \sim 20) + (13 \sim 20)$	1.8	3.5	25	5.0	5.0		
	2.5+2.5+2.5+2.5 2.5+2.5+2.5+3.5	$(10 \sim 16) + (10 \sim 16) + (10 \sim 16) + (10 \sim 16)$ $(9 \sim 14) + (9 \sim 14) + (9 \sim 14) + (13 \sim 20)$	2.5 2.5	2.5 2.5	2.5 2.5	© 2.5 © 3.5			
	2.5+2.5+2.5+5.0	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (16 ~ 25)	2.5	2.5	2.5	5.0			
	2.5+2.5+3.5+3.5 2.5+2.5+3.5+5.0	$\frac{(9 \sim 13) + (9 \sim 13) + (12 \sim 18) + (12 \sim 18)}{(8 \sim 12) + (8 \sim 12) + (12 \sim 12) + (11 \sim 16) + (15 \sim 23)}$	2.5	2.5 2.5	3.5 3.5	© 3.5 5.0	-		
	2.5+2.5+3.5+5.0 2.5+2.5+5.0+5.0	$ (8 \sim 12) + (8 \sim 12) + (11 \sim 16) + (15 \sim 23) (7 \sim 10) + (7 \sim 10) + (14 \sim 21) + (14 \sim 21) $	2.5 2.5	2.5	3.3	5.0	5.0		
	2.5+3.5+3.5+3.5	(8 ~ 12) + (11 ~ 17) + (11 ~ 17) + (11 ~ 17)	2.5	3.5	3.5	© 3.5			
	2.5+3.5+3.5+5.0 3.5+3.5+3.5+3.5	$(7 \sim 11) + (10 \sim 15) + (10 \sim 15) + (14 \sim 21)$ (10 ~ 16) + (10 ~ 16) + (10 ~ 16) + (10 ~ 16)	2.5 3.5	3.5 3.5	3.5 3.5	5.0 © 3.5			
	3.5+3.5+3.5+5.0	(9 ~ 14) + (9 ~ 14) + (9 ~ 14) + (13 ~ 20)	3.5	3.5	3.5	5.0			
	1.8+1.8+1.8+1.8+1.8	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.8	1.8	1.8	◎ 1.8 ◎ 1.9	© 1.8		
	1.8+1.8+1.8+1.8+2.5 1.8+1.8+1.8+1.8+3.5	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	<u>1.8</u> 1.8	<u>1.8</u> 1.8	1.8 1.8	◎ 1.8 ◎ 1.8	© 2.5 © 3.5		
	1.8+1.8+1.8+1.8+5.0	(6 ~ 9) + (6 ~ 9) + (6 ~ 9) + (6 ~ 9) + (17 ~ 25)	1.8	1.8	1.8	1.8	5.0		
	1.8+1.8+1.8+2.5+2.5	$\frac{(7 \sim 11) + (7 \sim 11) + (7 \sim 11) + (7 \sim 11) + (10 \sim 15) + (10 \sim 15)}{(6 \sim 10) + (6 \sim 10) + (6 \sim 10) + (9 \sim 14) + (13 \sim 19)}$	1.8	1.8	1.8	© 2.5	© 2.5		
	1.8+1.8+1.8+2.5+3.5 1.8+1.8+1.8+2.5+5.0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	<u>1.8</u> 1.8	<u>1.8</u> 1.8	1.8 1.8	© 2.5 © 2.5	© 3.5 5.0		
	1.8+1.8+1.8+3.5+3.5	(6 ~ 9) + (6 ~ 9) + (6 ~ 9) + (12 ~ 18) + (12 ~ 18)	1.8	1.8	1.8	© 3.5	© 3.5		
	1.8+1.8+1.8+3.5+5.0	(5 ~ 8) + (5 ~ 8) + (5 ~ 8) + (10 ~ 16) + (15 ~ 22) (5 ~ 7) + (5 ~ 7) + (5 ~ 7) + (13 ~ 20) + (13 ~ 20)	1.8	<u>1.8</u>	1.8	© 3.5 5.0	5.0		
	1.8+1.8+1.8+5.0+5.0 1.8+1.8+2.5+2.5+2.5	$ (5 \sim 7) + (5 \sim 7) + (5 \sim 7) + (13 \sim 20) + (13 \sim 20) $ (7 ~ 10) + (7 ~ 10) + (9 ~ 14) + (9 ~ 14) + (9 ~ 14) + (9 ~ 14)	<u>1.8</u> 1.8	<u>1.8</u> 1.8	1.8 2.5	5.0 © 2.5	<u>5.0</u> © 2.5		
ITS	1.8+1.8+2.5+2.5+3.5	(6 ~ 9) + (6 ~ 9) + (8 ~ 13) + (8 ~ 13) + (12 ~ 18)	1.8	1.8	2.5		© 3.5		
N	1.8+1.8+2.5+2.5+5.0 1.8+1.8+2.5+3.5+3.5	(5 ~ 8) + (5 ~ 8) + (8 ~ 11) + (8 ~ 11) + (15 ~ 23) (6 ~ 9) + (6 ~ 9) + (8 ~ 12) + (11 ~ 17) + (11 ~ 17)	<u>1.8</u> 1.8	<u>1.8</u> 1.8	2.5 2.5	© 2.5 © 3.5	5.0 © 3.5		
FIVE	1.8+1.8+2.5+3.5+5.0	(5 ~ 8) + (5 ~ 8) + (7 ~ 11) + (10 ~ 15) + (14 ~ 21)	1.8	1.8	2.5	© 3.5 © 3.5	5.0		
Ē	1.8+1.8+3.5+3.5+3.5	(5 ~ 8) + (5 ~ 8) + (10 ~ 15) + (10 ~ 15) + (10 ~ 15)	1.8	1.8	3.5	© 3.5	© 3.5		
	1.8+2.5+2.5+2.5+2.5 1.8+2.5+2.5+2.5+3.5	(6 ~ 9) + (9 ~ 13) + (9 ~ 13) + (9 ~ 13) + (9 ~ 13) (6 ~ 9) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (11 ~ 17)	<u>1.8</u> 1.8	2.5 2.5	2.5 2.5	© 2.5 © 2.5	◎ 2.5 ◎ 3.5		
	1.8+2.5+2.5+2.5+5.0	(5 ~ 8) + (7 ~ 11) + (7 ~ 11) + (7 ~ 11) + (14 ~ 22)	1.8	2.5	2.5	õ 2.5	5.0		
	1.8+2.5+2.5+3.5+3.5	$(5 \sim 8) + (7 \sim 11) + (7 \sim 11) + (10 \sim 16) + (10 \sim 16)$	1.8	2.5	2.5	© 3.5	© 3.5		
	1.8+2.5+2.5+3.5+5.0 1.8+2.5+3.5+3.5+3.5	$ (5 \sim 7) + (7 \sim 10) + (7 \sim 10) + (9 \sim 14) + (13 \sim 20) (5 \sim 8) + (7 \sim 10) + (10 \sim 15) + (10 \sim 15) + (10 \sim 15) $	<u>1.8</u> 1.8	2.5 2.5	2.5 3.5	© 3.5 © 3.5	5.0 © 3.5		
	2.5+2.5+2.5+2.5+2.5	$(3 \sim 12) + (3 \sim 12) + (8 \sim 12)$	2.5	2.5	2.5	© 3.5 © 2.5	© 3.5 © 2.5		
	2.5+2.5+2.5+2.5+3.5	(8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (8 ~ 12) + (11 ~ 16)	2.5	2.5	2.5	⊚ 2.5	© 3.5		
	2.5+2.5+2.5+2.5+5.0 2.5+2.5+2.5+3.5+3.5	$\frac{(7 \sim 10) + (7 \sim 10) + (7 \sim 10) + (7 \sim 10) + (7 \sim 10) + (14 \sim 21)}{(7 \sim 11) + (7 \sim 11) + (7 \sim 11) + (7 \sim 11) + (10 \sim 15) + (10 \sim 15)}$	2.5 2.5	2.5 2.5	2.5 2.5	© 2.5 © 3.5	5.0 © 3.5		
1		$(7 \sim 10) + (7 \sim 10) + (9 \sim 14) + (9 \sim 14) + (9 \sim 14)$	2.5	2.5	3.5	© 3.5	© 3.5		

2.5, 3.5, 4.0, 5.0 means indoor units cooling capacity class

(1) Marking (1) \mathbb{O} : needs flare adater (9.52 \rightarrow 12.7D): part No. TA261D-4 001 \mathbb{O} : needs flare adater (12.7 \rightarrow 9.52D): part No. TA261D-6 002

(2) Suitable room size is determined based on the conditions below:
Climate is the temperature zone like Tokyo, Japan.
For usual residential use.

Smaller figure is for light construction which means light thermally sealed.

• larger figure is for heavy construction which means well thermally sealed.

1. NEW REFRIGERANT

(1) New refrigerant R410A with no harmful effect on the ozone layer

Refrigerant R410A, which does not damage the ozone layer, was adopted instead of HCFC-22 which is planned to be phased out globally by 2020.

(2) New refrigerating oil

The new refrigerant HFC-R410A is not compatible with conventional mineral oils and no lubrication can be expected with those oils. To solve this, the artificial synthetic ester oil is newly adopted.

Cautions in relation to HFC (R410A)

1. Safety during Servicing

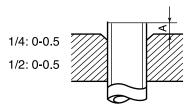
This air conditioner uses the new refrigerant HFC (R410A) for protecting the ozone layer. R410A has several different characteristic features from HCFC-22. Therefore keep the following care items during servicing for safety.

- (1) Since the working pressure of R410A model is about 1.6 times higher than that of HCFC-22 models, it becomes necessary to use part of piping materials and servicing tools exclusive for R410A model.
- (2) It is necessary to exercise more care to prevent the foreign matters (oil, moisture, etc.) from mixing into the piping than in the case of HCFC-22 model. Also, when storing the piping, securely seal its openings with pinching and taping, etc..
- (3) Be sure to charge the refrigerant from the liquid-phase side, as the liquid-phase/gas-phase-composition changes a little in the case of R410A model.
- (4) Never use refrigerant other than R410A in an air conditioner which is designed to operate with R410A.
- (5) If a refrigeration gas leakage occurs during servicing, be sure to ventilate fully. If the refrigerant gas comes into contact with fire, a poisonous gas may occur.
- (6) When installing or removing an air conditioner, do not allow air or moisture to remain in the refrigeration cycle. Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture or personal injury may be caused.
- (7) After completion of service work, check to make sure that there is no refrigeration gas leakage. If the refrigerant gas leaks into the room, coming into contact with fire in the fandriven heater, space heater, etc., a poisonous gas may occur.

- 2. Refrigerant Piping Materials
 - (1) Thickness of Refrigerant Piping Although the thickness is same as that for HCFC-22 model, as R410A model features higher pressure, be sure to confirm the thickness prior to use.
 - % Do not use thin pipes (thinner than 0.7 mm).
 - (2) Flare's Expansion Pipe The projection when the new flare tool is used, is as follows. When using the conventional flare tool, be sure to secure the following projection by using a gauge for projection adjustment.
 - When using the conventional flare tool, use a gauge for projection adjustment.
 - (3) Flare Nut Dimensions Along with changes in the expansion pipe dimensions, the opposite side dimensions of flare nuts whose nominal diameter is 1/2 change so that different torque wrenches must be used.
 - *Figures in () denote those for HCFC-22.

Nominal diameter	Outside diameter (mm)	Thickness (mm)
1/4	6.35	0.8
3/8	9.52	0.8
1/2	12.70	0.8

Projection "A"(mm) for Flare Tool for R410A (Clutch Type)



Nominal diameter	Opposite Side Dimensions (mm) of Flare Nuts for R410A
1/4	17 (17)
3/8	22 (22)
1/2	26 (24)

3. Servicing Tools

(Changes in the Product and Components)

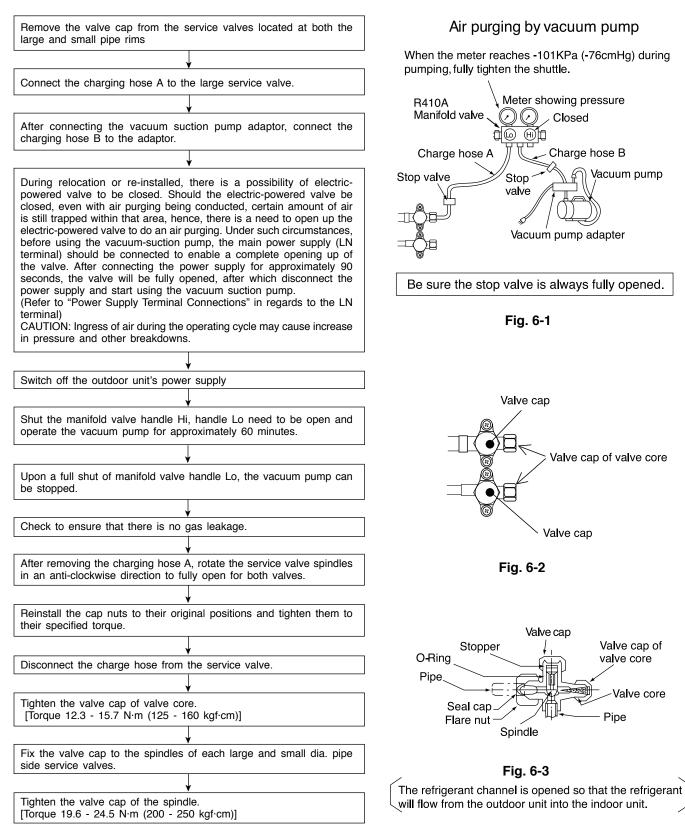
- In order to prevent any other refirigerant from being charged, R410A model is provided with the outdoor unit whose control valve has a different service port diameter (port size: 7/16 UNF 20 threads per inch → 1/2 UNF 20 threads per inch).
- In order to secure larger pressure resisting strength, flare expansion pipe dimensions and flare nut dimensions have been changed.

(New	Tools	for	R410A)	

New tools for R410A	Applicable to HCFC-22 Model	Changes
Gauge manifold	×	As pressure is high, it is impossible to measure by means of conventional gauge. In order to prevent any other refrigerant from being charged, each port diameter has been changed.
Charge hose	×	In order to increase pressure resistance, hose materials and port size have been changed (to 1/2 UNF 20 threads per inch). When purchasing a charge hose, be sure to confirm the port size.
Electronic balance for refrigerant charging	0	As pressure is high and gasification speed is fast, it is difficult to read the indicated value by means of charging cylinder, as air bubbles occur.
Torque wrench	× (nominal diam. 1/2, 5/8)	The opposite side dimensions of flare nuts increase. Incidentally, a common wrench is used for nominal diameters 1/4 and 3/8.
Flare tool (clutch type)	0	By increasing the clamp bar's receiving hole, strengh of spring in the tool has been improved.
Gauge for projection adjustment	_	Used when performing flare processing by means of conventional flare tool.
Vacuum pump adapter	0	Connected to conventional vacuum pump.
Gas leakage detector	×	Exclusive for HFC refrigerant.

- Incidentally, the "refrigerant cylinder" comes with the refrigerant designation (R410A) and protector coating in the U.S.'s ARI specified rose color (ARI color code: PMS 507).
- Also, the "charge port and packing for refrigerant cylinder" require 1/2 UNF 20 threads per inch corresponding to the charge hose's port size.

4. Air purging by using vacuum pump



A CAUTION

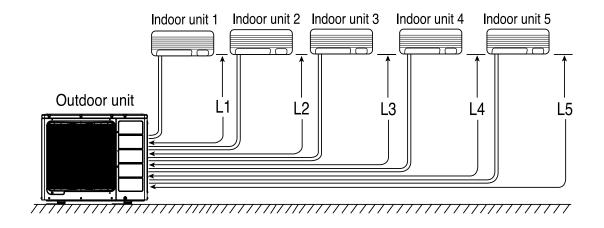
- 1. Be sure to use the vacuum pump, vacuum pump adapter and manifold gauge and refer to their instruction manuals beforehand.
- 2. Ascertain that the vacuum pump is filled with oil to the level designated on the oil gauge.
- 3. After closed the ball valve of charge hose, it should be disconnected at service port side and refrigerant cylinder side at first. Next, after discharging the remained gas in the charge hose by opening the ball valve a little, disconnect it at manifold gauge side. You can prevent sudden release of refrigerant by connecting the ball valve to service port. And you can work more safety.

INSTALLATION

PIPE LENGTH

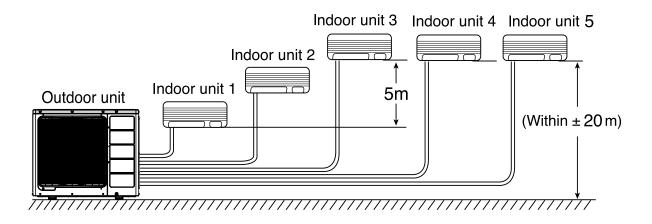
- (1) Total 75m maximum pipe length.
- (2) Pipe length for one indoor unit : maximum 25m.

: minimum 3m.

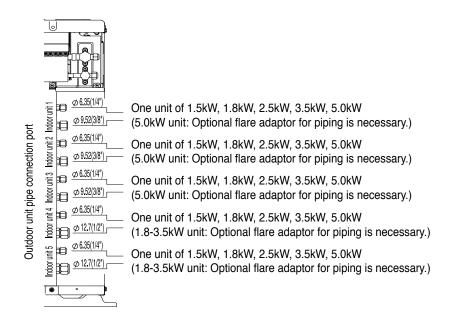


HIGHT DIFFERENCE

- (1) Height : maximum ± 20m
- (2) Height difference between each indoor unit \leq 5m.

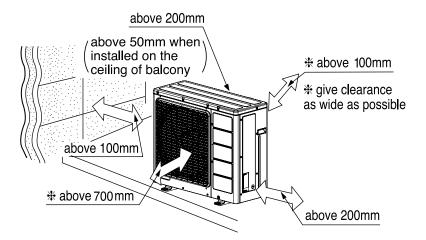


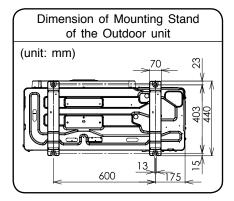
- To the outdoor unit, up to five indoor units can be connected until the total value of capacity to 15.5kW.
- Make sure to connect two or more indoor units.



Flare adaptor for piping The flare adaptor for piping is required depending on combination of indoor units. • $09.52 (3/8") \rightarrow 0 12.7 (1/2")$ Parts number TA261D-4 001 • $012.7(1/2") \rightarrow 0 9.52 (3/8")$ Parts number TA261D-6 002 • $012.7(1/2") \rightarrow 0 15.88(5/8")$ Parts number TA261D-6 003

- Remove the side cover.
- For installation, refer as shown below.
- The space indicated with a \Leftrightarrow mark is required to guarantee the air conditioner's performance. Install the airconditioner in a place big enough to provide ample space for servicing and repairs later on.

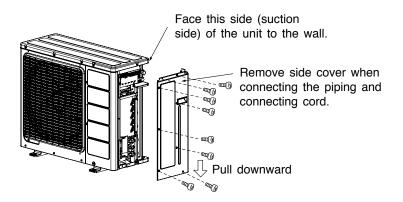




Connecting the pipe

• Install the unit in a stable place to minimize vibration or noise.

• After arranging the cord and pipes, secure them inplace.



• Hold the handle of the side cover. Slide down and takeoff the corner hook, then pull. Reverse these steps when installing.

- 1. Remove flare nut from service valve.
- 2. Apply refrigerant oil to flare nut sections of servicevalve and pipings.
- 3. Match center of piping to large diameter side service valve and tank assembly, and tighten flarenut first by hand, then securely tighten using torque wrench.
- 4. Perform air purge and gas leak inspection.
- 5. Wrap the provided insulating material around sidepiping using vinyl tape.

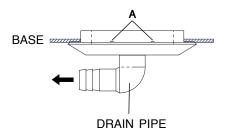
Condensed water disposal of outdoor unit

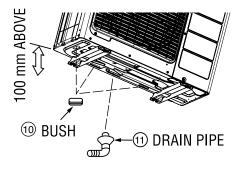
- · There is holes on the base of outdoor unit for condensed water to exhaust.
- To lead condensed water to the drain hole, place the outdoor unit on the mounting stand (optional) or on blocks to raise its level more than 100mm from the ground surface. Connect the drain pipe as shown in the figure. Cover two other water drain holes with the bushings included. (To insall a bushing, push in both ends of the bushing so that it aligns with the drain hole.)
- When connecting the drain pipe, make sure that the bushing does not lift off or deviate from the base.
- · Install the outdoor unit on a stable, flat surface and check to see that the condensed water drains.

When Using and Installing in Cold Areas

When the air conditioner is used in low temperature and in snowy conditions, water from the heat exchanger may freeze on the base surface to cause poor drainage. When using the air conditioner in such areas, do not install the bushings. Keep a minimum of 250mm between the drain hole and the ground. When using the drain pipe, consult your sales agent.

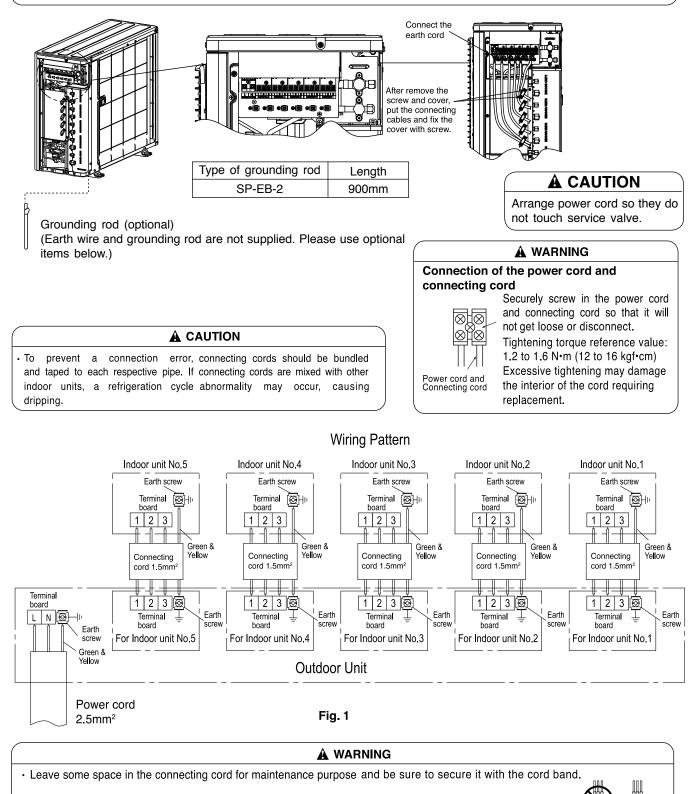
* For more details, refer to the Installation Manual for Cold Areas.





Connection of the connecting cords and power cord. (Outdoor unit) RAM-90NP5B

- Connecting cord should be connected according to Fig.1, that the Indoor unit No. shall match with terminal board No.
 of Outdoor unit.
- · Be sure to fix the connecting cord with the band as shown below. Otherwise water leakage causes short circuit or faults.



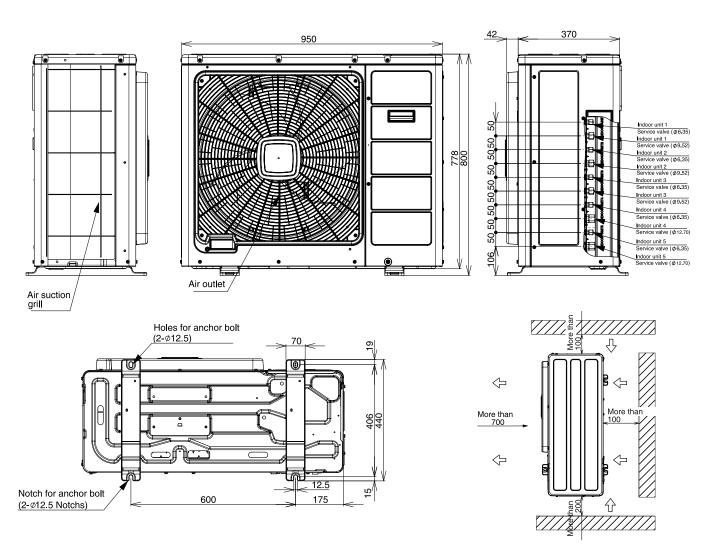
• Secure the connecting cord along the coated part of the wire using the cord band. Do not exert pressure on the wire as this may cause overheating or fire.

· Hold the handle of the side cover, slide down and take off the corner hook, then pull. Reverse these steps when installing.

0 0

CONSTRUCTION AND DIMENSIONAL DIAGRAM

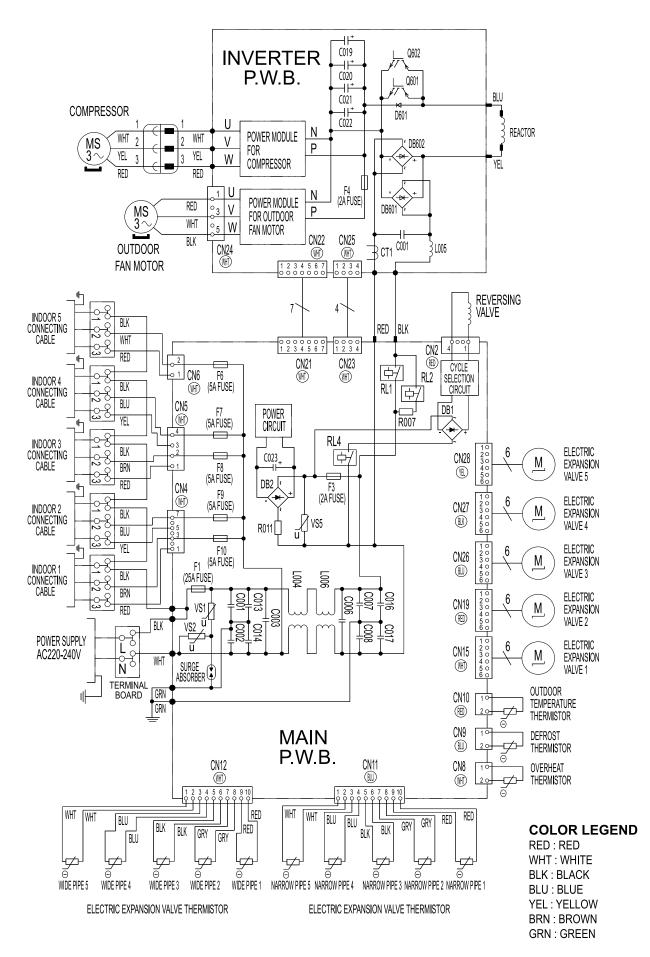
MODEL RAM-90NP5B



Service space

WIRING DIAGRAM

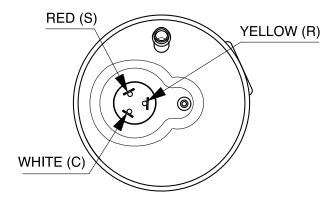
MODEL RAM-90NP5B



COMPRESSOR MOTOR

Compressor Motor Specifications

MODEL		RAM-90NP5B	
COMPRESSOR MODEL			JU182XC1
PHASE			SINGLE
RATED VOLTAGE			AC 220 ~ 240 V
RATED FREQUENCY			50/60 Hz
POLE NUMBER			4
CONNECTION		(U) WHITE (V) YELLOW (W) RED	
RESISTANCE VALUE	20°C (68°F)	U-V V-W W-U	0.410 0.397 0.390
(Ω)	75°C	U-V	0.499
	(167°F)	V-W	0.483
		W-U	0.474



MAIN PARTS COMPONENT

FAN MOTOR

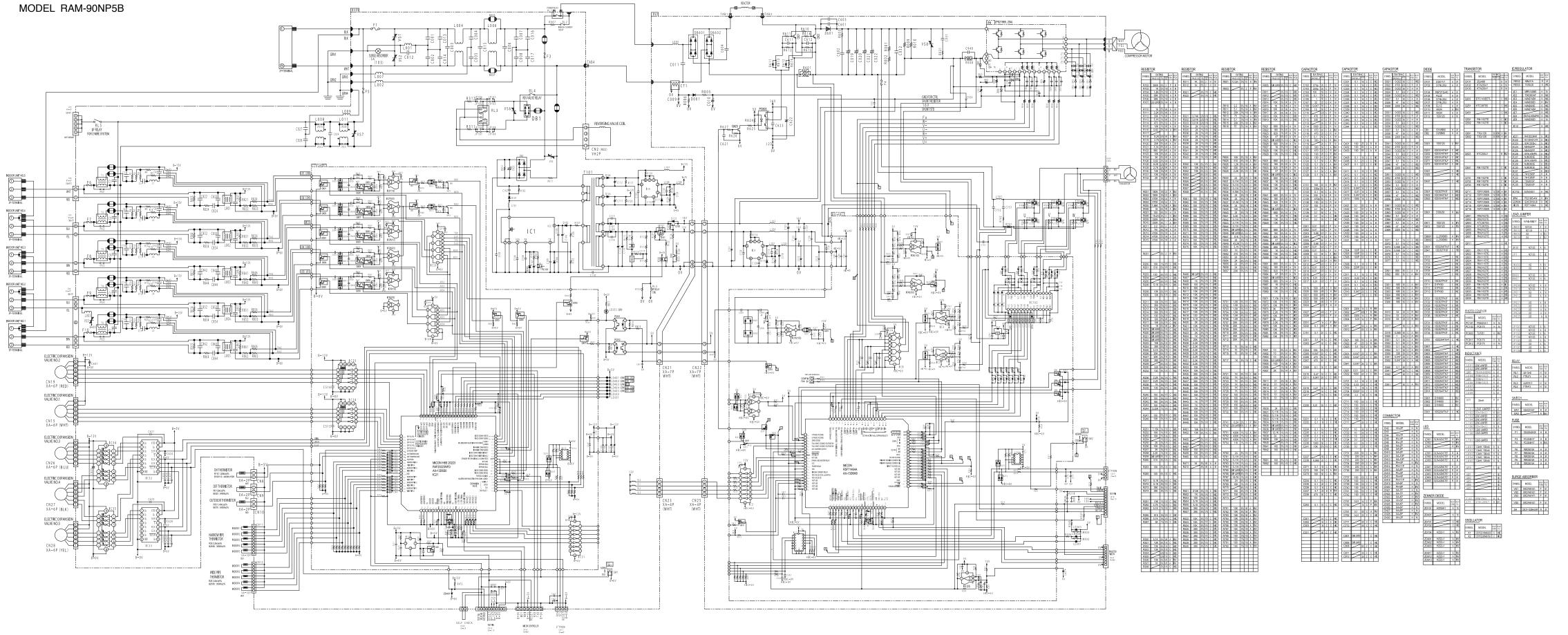
Fan Motor Specifications

BLK : BLACK PNK : PINK

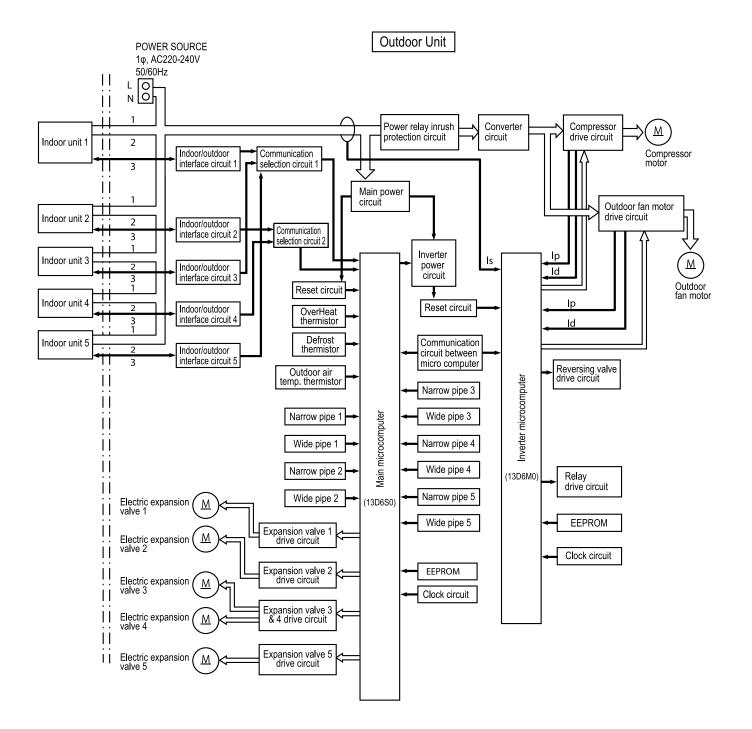
MODEL		RAM-90NP5B
POWER SOURCE		DC : 280V
OUTPUT		138W
CONNECTION		BLACK (V) ORED (W)
RESISTANCE VALUE	20°C (68°F)	U-V: 18.86 ± 1.9Ω V-W: 18.86 ± 1.9Ω W-U: 18.86 ± 1.9Ω
	EL : YELLOW	

VIO : VIOLET

CIRCUIT DIAGRAM

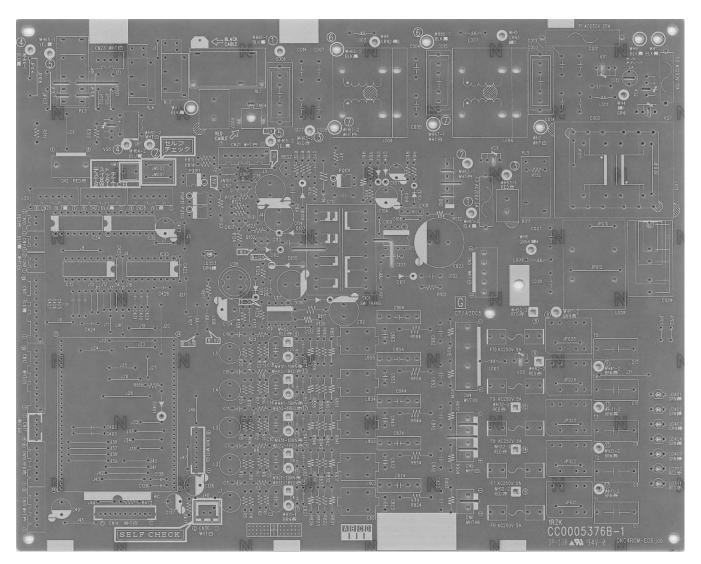


MODEL RAM-90NP5B



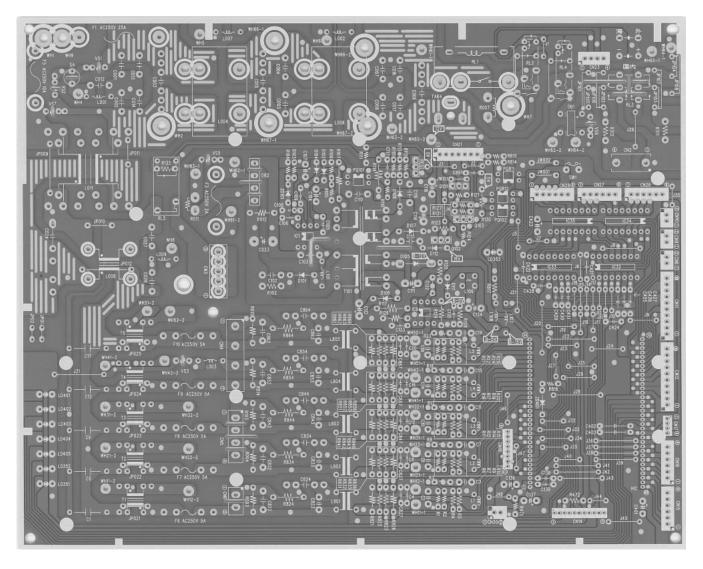
PRINTED WIRING BOARD LOCATION DIAGRAM

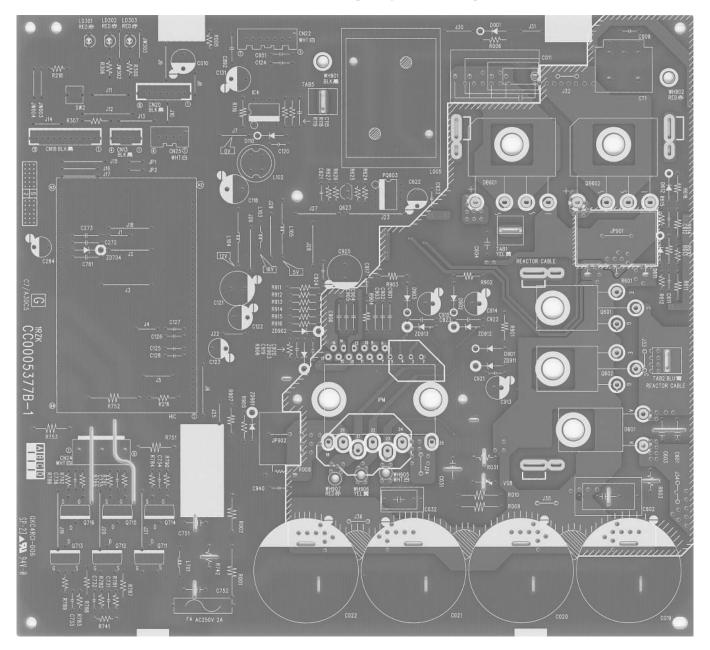
RAM-90NP5B



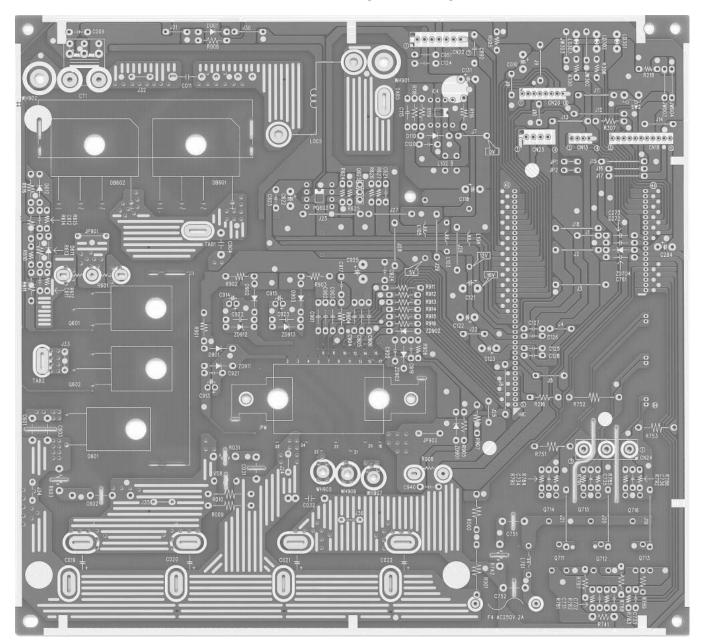
Main board [component side]

Main board [solder side]



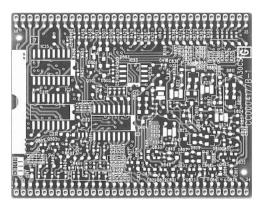


Inverter board [component side]

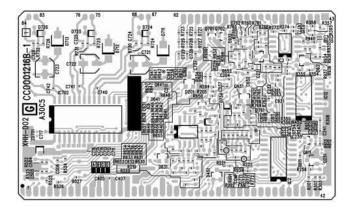


Inverter board [solder side]

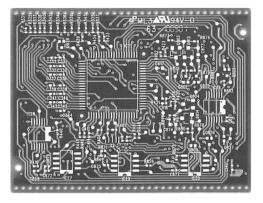
[Main board (HIC2)] top side



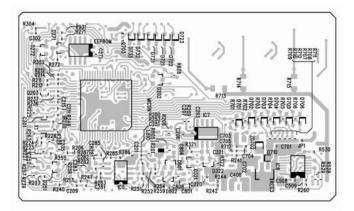
[Inverter board (HIC1)] top side



[Main board (HIC2)] bottom side



[Inverter board (HIC1)] bottom side

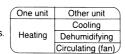


	Operation mode	Fan	Cooling	Dehumidifying	Heating	
	operation of stop switch			Start / stop_switch Start Start	Stop Start Stop	
	ff-timer			Start / stop switch Reserve switch Cancel switch Operation lamp Timer lamp Remote controller timer mark "O" Timer memory	(Off-timer during stop) (Change in reserved time)	
Timer functions	n-timer			Start / stop switch Reserve switch Cancel switch Operation lamp Timer lamp Remote controller timer mark "1" Timer memory (Change in reserved	time) (Off-timer during operation)	
oor fan) nV	ıto		Changes from "Hi" to "Med" or "Lo" depending on room temperature. Temperature set tor cooling <u>tor be a set of the set of</u>		Set to "Ultra-Lo", "Lo", "Med", "Hi", "Ultra-Hi" or "stop" depending on the room temperature, time and heat exchange temperature. Set to "stop" if the room temperature is 18°C in the "Ultra-Lo" mode other than during preheating (cooling is recovered at 18.33°C). When the compressor is running at maximum speed during hot dash or when recovered from defrosting.	Operation mode O Judgment based on the temperature: Cooling: external temperature temperature < 25°C and Heating: external temperature < 21°C and Dehumidifying: 21°C ≤ extemperature ≤ 27°C, or and room temperature > O Set to the mode of the operating. If, when one indoor unit is the other unit will also enter lif, when one indoor unit unit is set to auto, the dehumidifying operation.
speed mode (indoor		Operates at "Hi" regardless of the room temperature.			Set to "Ultra-Lo", "Lo", "Med", "Hi", "Ultra-Hi" or "Stop" depending on the room temperature and time. Set to "Stop" if the room temperature is 18°C in the "Ultra-Lo" mode other than during preheating (cooling is recovered at 18.33°C). Set to "Ultra-Hi" when the compressor is running at maximum speed during hot dash or when recovered from defrosting.	32 31 30 29 28 28 27 26 26
Me La	ed	Operates at "Med" regardless of the room temperature.	Same as at left.		Set to "Ultra-Lo", "Lo", "Med" or "Stop" depending on the room temperature and time. Set to "Stop" if the room temperature is 18°C in the "Ultra-Lo" mode other than during preheating (cooling is recovered at 18.33°C).	Ê 22
Lo	,	Operates at "Lo" regardless of the room temperature.	Same as at left.	Set to "Lo" in modes other than when the compressor stops.	Set to "Ultra-Lo", "Lo", or "Stop" depending on the room temperature and time. Set to "Stop" if the room temperature is 18°C in the "Ultra-Lo" mode other than during preheating (cooling is recovered at 18.33°C). The fan speed is controlled by the heat exchanger temperature; the overload control is executed as in the following diagram:	P 21 20 19 18 18 17 16 14 15 16 17 18 1 Extern * Operation mode stays un temperature changes duri
	peration of ture controller	Performs only fan operation at the set speed regardless of the room temperature.	See page 53.	See page 95.	See page 99.	 Set room temperature) All the following temperature using the remote control: (Cooling: 27°C Heating: 23°C Dehumidifying: Current root lower limit: 23°C) ※ Operates at a target of states of states
Sleep op (with sle	peration eep button ON)	Enters sleep operation after set as on the left. Action during sleep operation silent (sleep) operation	·Same as at left. ·See page 55.	·Same as at left. ·See page 97.	·Same as at left. ·See page 99.	·Same as at left. ·Performs the sleep op

Combination of operations:

When operation mode is selected:

You cannot operate the indoor units in the following combinations.
The indoor unit which is switched on first continues to operate, but other indoor units which is switched on later, does not operate while the lamp lights.



During automatic operation:

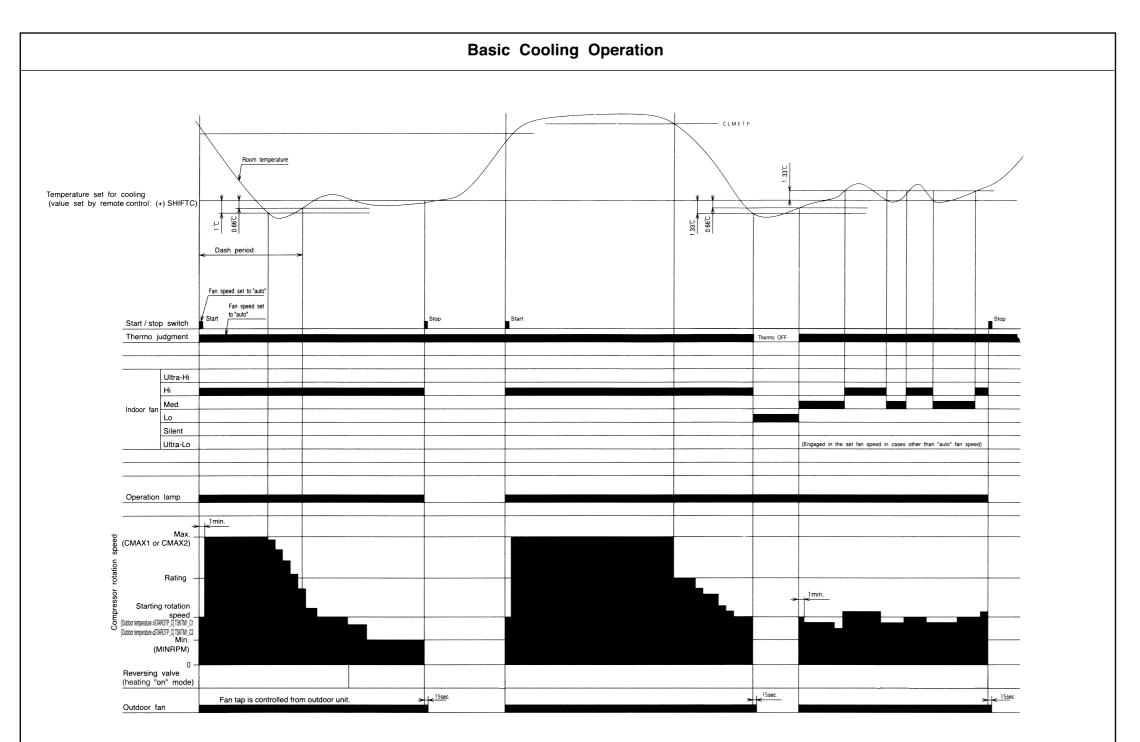
•When heating operation is automatically selected for the first indoor unit, the next indoor unit will then start to heat. Also, if cooling or dehumidifying is automatically selected for the first indoor unit, the next indoor unit will also start to cool or dehumidify.

Notes:

- 1. Refer to the PWRITE-ZU data for the conletters in the drawing.
- The speed set of rotaion for the fan moto as shown in Table 1.
- 3. The set room temperatures in the diagram include the shift values in Table 2.

Auto
n the room temperature and external
nperature $\geq 25^{\circ}$ C, or 21°C \leq external
and room temperature > 27° C nperature < 18°C, or 18°C \leq external and room temperature $\leq 23^{\circ}$ C
\leq external temperature $< 25^{\circ}$ C and room or 18°C \leq external temperature $< 21^{\circ}$ C
> 23°C the indoor unit that has previously been
nit is heating, the other unit is set to auto, enter the heating operation.
unit is cooling or dehumidifying, the other the other unit will enter the cooling or on.
$\frac{1}{12} \frac{1}{12} \frac$
onstants expressed by capital alphabe
tor in each operation mode are

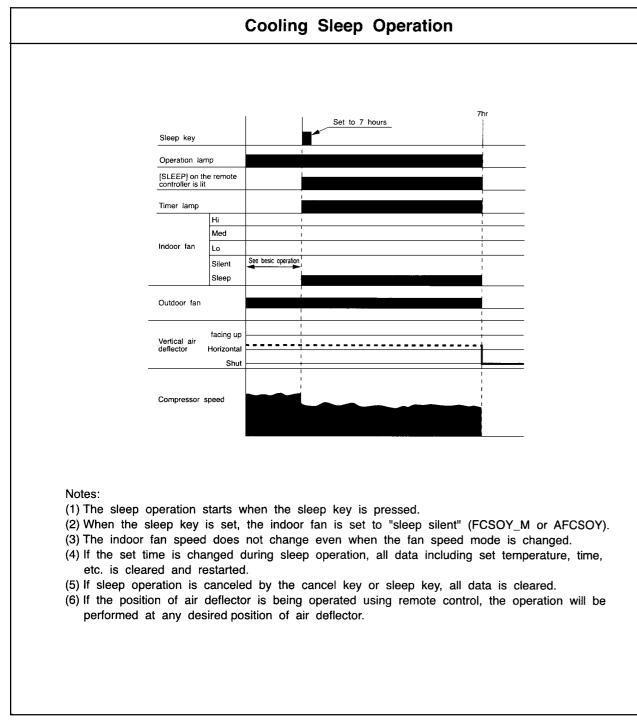
PROM NO. LABEL NAME REQUIRED VALUE OF UN OAE OH_ON_C 118.2 °C OAF OH_OFF_C 104.7 °C OB6 OH_ON_W 100.0 °C OB7 OH_OFF_W 86.5 °C 108 PSTARTC1_d 250 109 PSTARTC2_d 180 100 PSTARTC2_d 180 1010 PSTARTC2_d 300 102 PSTARTC3_d 180 103 PSTARTC4K_d 300 104 PSTARTC4K_d 300 105 PSTARTC4K_d 300 106 PSTARTC5K_d 300 110 PSTARTC5K_d 300 111 PSTARTC4K_d 300 1111 PSTARTH2_d 150 1112 <td< th=""><th></th></td<>	
OAF OH_OFF_C 104.7 °C OB6 OH_ON_W 100.0 °C OB7 OH_OFF_W 86.5 °C 108 PSTARTC1_d 250 109 PSTARTC2_d 180 10A PSTARTC2_d 180 10B PSTARTC2K_d 300 10C PSTARTC3K_d 300 10D PSTARTC4_d 180 10D PSTARTC4_d 300 10E PSTARTC4_d 300 10F PSTARTC4_d 180 10F PSTARTC5_d 180 110 PSTARTC5_d 300 111 PSTARTC5_d 300 112 PSTARTC5_d 300 113 PSTARTH1_d 200 114 PSTARTH2_d 150 115 PSTARTH3_d 150 117 PSTARTH3_d 200 118 PSTARTH3_d 200 118 PSTARTH4_d 160 119 PSTARTH5_d 200 <td></td>	
OB6 OH_ON_W 100.0 °C OB7 OH_OFF_W 86.5 °C 108 PSTARTC1_d 250 109 PSTARTC2_d 300 10A PSTARTC2_d 180 10B PSTARTC2_d 300 10A PSTARTC2_d 300 10B PSTARTC2_d 300 10C PSTARTC3_d 300 10D PSTARTC4_d 300 10E PSTARTC4_d 300 10F PSTARTC5_d 180 110 PSTARTC5_d 300 111 PSTARTC5_d 300 112 PSTARTC5_d 300 113 PSTARTH1_d 200 113 PSTARTH2_d 150 114 PSTARTH3_d 250 114 PSTARTH3_d 200 115 PSTARTH3_d 200 116 PSTARTH3_d 150 117 PSTARTH4_d 150 118 PSTARTH5_d 200	
OB7 OH_OFF_W 86.5 °C 108 PSTARTC1_d 250 109 PSTARTC1K_d 300 10A PSTARTC2_d 180 10B PSTARTC2K_d 300 10C PSTARTC3_d 180 10D PSTARTC4_d 300 10C PSTARTC4_d 300 10D PSTARTC4_d 300 10E PSTARTC4_d 180 10F PSTARTC5_d 300 110 PSTARTC5_d 180 111 PSTARTC5_d 300 112 PSTARTC5_d 300 113 PSTARTH1_d 200 113 PSTARTH2_d 150 114 PSTARTH2_d 150 115 PSTARTH3_d 200 116 PSTARTH3_d 200 117 PSTARTH3_d 200 118 PSTARTH4_d 150 119 PSTARTH5_d 200 11A PSTARTH5_d 200	
108 PSTARTC1_d 250 109 PSTARTC1K_d 300 10A PSTARTC2_d 180 10B PSTARTC2_d 300 10C PSTARTC3_d 300 10D PSTARTC3_d 180 10D PSTARTC4_d 300 10E PSTARTC4_d 300 10F PSTARTC4_d 180 10F PSTARTC5_d 180 110 PSTARTC5_d 300 111 PSTARTC5_d 300 112 PSTARTC5_d 300 113 PSTARTH2_d 250 114 PSTARTH2_d 150 115 PSTARTH3_d 150 116 PSTARTH3_d 200 117 PSTARTH3_d 200 118 PSTARTH4_d 150 119 PSTARTH5_d 200 11A PSTARTH5_d 200 11B PSTARTH5_d 160 11B PSTARTH5_d 150 </td <td></td>	
109 PSTARTC1K_d 300 10A PSTARTC2_d 180 10B PSTARTC2K_d 300 10C PSTARTC3_d 180 10D PSTARTC3_d 180 10D PSTARTC4K_d 300 10E PSTARTC4K_d 300 10F PSTARTC4K_d 300 110 PSTARTC5_d 180 111 PSTARTC5_d 300 112 PSTARTC5K_d 300 112 PSTARTH1_d 200 113 PSTARTH2_d 150 114 PSTARTH2_d 150 115 PSTARTH3_d 200 116 PSTARTH3_d 200 117 PSTARTH3_d 200 118 PSTARTH4_d 150 119 PSTARTH5_d 200 11A PSTARTH5_d 200 11B PSTARTH5_d 160 11B PSTARTH5_d 150 126 DFSPPS_d 10	
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111 PSTARTC5K_d 300 112 PSTARTH1_d 200 113 PSTARTH1_d 250 114 PSTARTH2_d 150 115 PSTARTH2_d 200 116 PSTARTH3_d 200 117 PSTARTH3_d 200 118 PSTARTH4_d 150 119 PSTARTH5_d 200 11A PSTARTH5_d 200 11B PSTARTH5_d 200 126 DFSPPS_d 10	
112 PSTARTH1_d 200 113 PSTARTH1S_d 250 114 PSTARTH2_d 150 115 PSTARTH2S_d 200 116 PSTARTH3_d 150 117 PSTARTH3S_d 200 118 PSTARTH4_d 150 119 PSTARTH5_d 200 118 PSTARTH5_d 160 119 PSTARTH5_d 160 118 PSTARTH5_d 160 119 PSTARTH5_d 160 118 PSTARTH5_d 160 119 DSTARTH5_d 160 118 PSTARTH5_d 160 118 PSTARTH5_d 10	
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118 PSTARTH4_d 150 119 PSTARTH4S_d 200 11A PSTARTH5_d 160 11B PSTARTH5S_d 200 124 DFCTPS_d 150 126 DFSPPS_d 10	
119 PSTARTH4S_d 200 11A PSTARTH5_d 160 11B PSTARTH5S_d 200 124 DFCTPS_d 150 126 DFSPPS_d 10	
11A PSTARTH5_d 160 11B PSTARTH5S_d 200 124 DFCTPS_d 150 126 DFSPPS_d 10	
11B PSTARTH5S_d 200 124 DFCTPS_d 150 126 DFSPPS_d 10	
124 DFCTPS_d 150 126 DFSPPS_d 10	
126 DFSPPS_d 10	
— — — — — — — — — — — — — — — — — — — —	
127 DFPSMX_d 400	
12B PCLOSH_d 86	
238 STAROTP_C 25.0 °C	
239 SDRCT1_C1 2500 min ⁻¹	
23A TSKTM1_C1 60 sec	
2B SDRCT1_C2 2500 min ⁻¹	-
23C TSKTM1_C2 60 sec	
23D STAROTP_W 4.8 °C	
23E SDRCT1_W1 2500 min ⁻¹	
23F TSKTM1_W1 60 sec	
240 SDRCT1_W2 2500 min ⁻¹	
241 TSKTM1_W2 60 sec	
242 SDSTEP 500 min ⁻¹	
243 TSKSPT 30 sec	
24E CMAX1 5300 min ⁻¹	
24F CMAX2 7000 min ⁻¹	
251 CMAX3 7000 min ⁻¹	
253 CMAX4 7000 min ⁻¹	
255 CMAX5 7000 min ⁻¹	
25B WMAX1 6500 min ⁻¹	
25C WMAX2 7000 min ⁻¹	
25F WMAX3 7000 min ⁻¹	
264 WMAX4 7000 min ⁻¹ 26B WMAX5 7000 min ⁻¹	
26B WMAX5 7000 min ⁻¹ 3C2 TDF414 90 sec	
3C2 1DF414 90 sec 3C3 TDF415 90 sec	
3C3 1DF415 90 Sec 3C4 DFMXTM 12 min	
3C4 DFMXTM 12 mm 3C5 SDRCT2 2000 min ⁻¹	
3C5 SDRC12 2000 mm ⁻	
3C6 15KTM2 70 sec 3C7 DFSTEP 500 min ⁻¹	
3C7 DFSTEP 500 mm * 3C8 TDFSPT 60 sec	
3C8 1DFSP1 60 sec 3C9 DEFMAX 400 min ⁻¹	
3C9 DEFMAX 400 min ⁻¹ 3CC DFSTMB 50 min	
3CC DFSTMB 50 min 3CD DFSTMB2 60 min	



Notes:

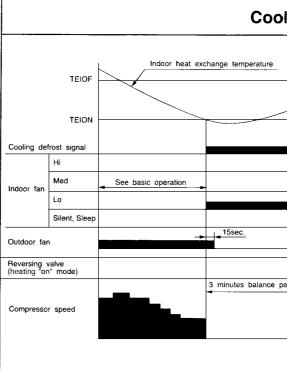
- (1) Cool dash is started when the operation is started at fan speed "AUTO" or "HI" or when the fan speed is changed to "AUTO" or "HI" during cooling operation, and when the compressor speed (P item) reaches (CMAX1 ro CMAX2) or higher.
- (2) The maximum compressor speed period during cool dash is finished.
 - 1 When 25 minutes have elapsed after cool dash was started.
 - 2 When the room temperature reaches the cooling set temperature -1°C (including cooling shift) and then becomes lower than the preset temperature by 0.66°C after the steady speed period
 - 3 When thermo is OFF.
 - (If cool dash finished in the above 1, the compressor does not go through the steady speed period but it starts fuzzy control.)
- (3) The thermo OFF temperature during cool dash is cooling set temperature (including cooling shift) -3°C. After thermo OFF, cool dash is finished and fuzzy control starts.
- (4) The compressor minimum ON time and minimum OFF time is 3 minutes.
- (5) The time limit for which the maximum compressor speed (CMAX1 or CMAX2) during normal cooling can be maintained is less than 60 minutes when the room temperature is less than CLMXTP: it is not provided when the room temperature is CLMXTP or more.
- (6) Compressor speed is determined by instruction sent from indoor unit and corrected by outdoor unit according to such factors as capacity, fan speed, number of units being operated, outdoor temperature, etc.
- (7) If another indoor unit is doing heating operation, cooling operation cannot be done.

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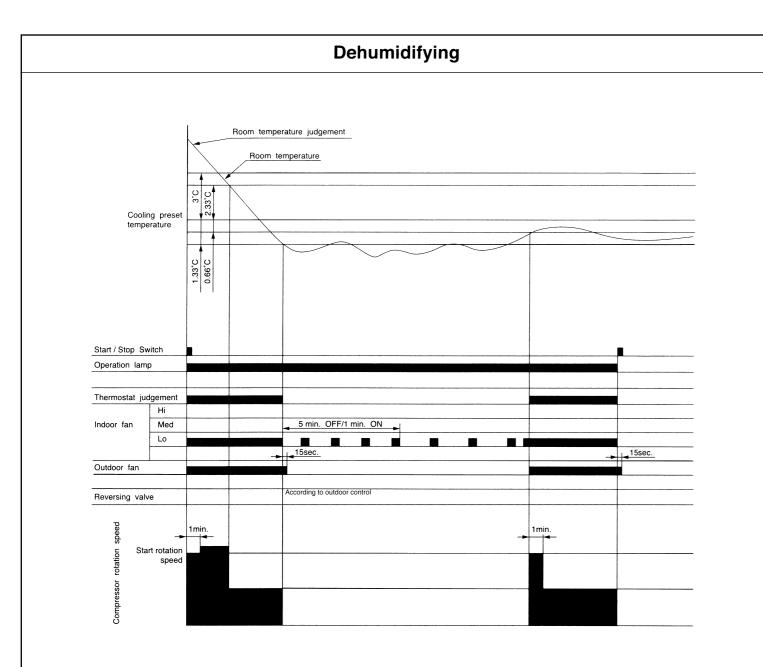




1. Refer to the PWRITE-ZU data for the constants expressed by capital alphabet letters in the drawing.

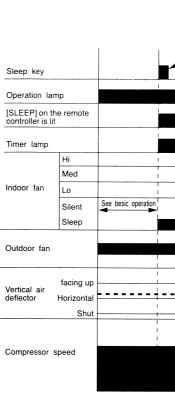


lin	g Defrost	
		See basic operation
eriod		1min.
	(Outdoor temperature > STAROTP_C) TSKTM1_C1 (Outdoor temperature \leq STAROTP_C) TSKTM1_C2	



Notes:

- (1) The indoor fan is operated in the "Lo" mode, OFF for 5 minutes and ON for 1 minute, repeatedly according to the humidity judgement when the thermostat is turned OFF.
- (2) The commpressor is operated forcedly for 3 minutes after operation is started.
- (3) The minimum ON time and OFF time of the compressor are 3 minutes.
- (4) At the start of operation, the thermostat will be off when room temperature \leq setting temperature -1.33°C; the thermostat will be on when room temperature \geq setting temperature -0.66°C.
- (5) The following procedure is performed to prevent excessive cooling during operation other than start. However, this procedure applies only when the thermostat is intermittent:
 - · Whether THERMO ON is to continue or not depends on the thermal condition when the 3-minute forced operation ceases.
 - ① "THERMO ON continues" when room temperature ≥ setting temperature +1°C: (The THERMO operation value is usually the same as that at "start of operation")
 - 2 "Forced THERMO OFF" when room temperature < setting temperature +1°C: (The same THERMO operation value as that at "start of operation" is usually used for recovery)
 - Therefore, if the air-conditioner is stabilized under this thermal condition, it will enter intermittent operation, which is "3-minute operation/3-minute stop".
- (6) Compressor speed is determined by instruction sent from indoor unit and corrected by outdoor unit according to such factors as capacity, fan speed, number of units being operated, outdoor temperature, etc.



Notes:

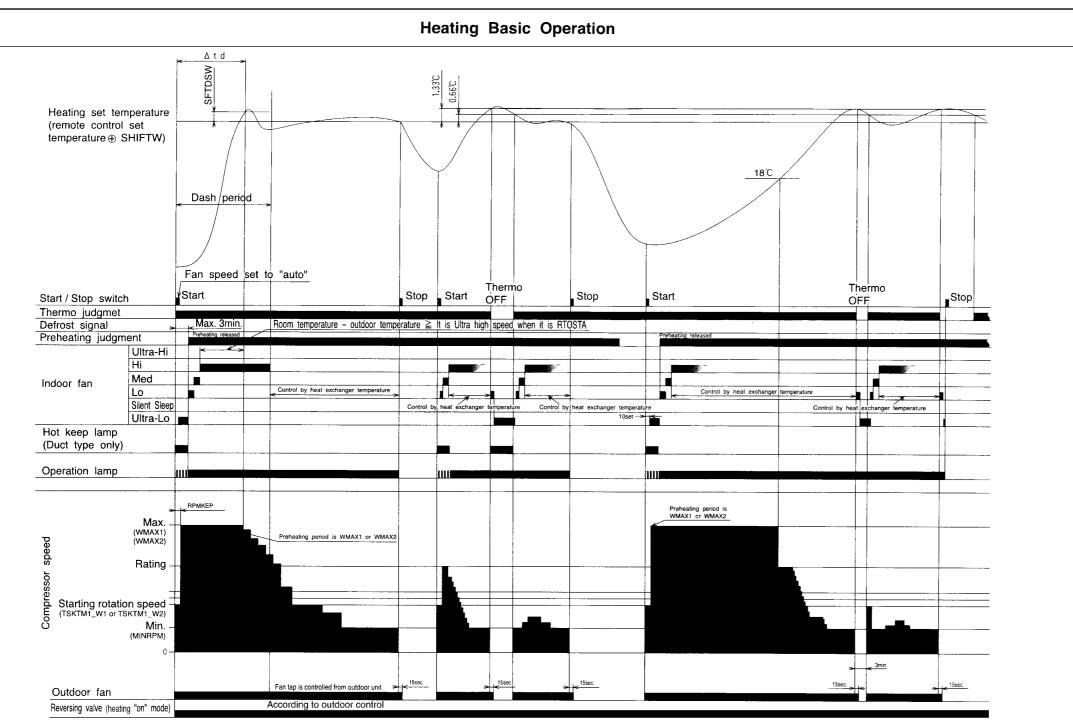
- (1) The sleep operation starts when the sleep key is pressed.
- (2) When the sleep key is set, the indoor fan is set to "sleep silent" (FDOY_M or AFDOY).
- (3) The indoor fan speed does not change even when the fan speed mode is changed.
- restarted.
- (5) If sleep operation is canceled by the cancel key or sleep key, all data is cleared.
- position of air deflector

Dehumidifying Sleep Operation

	7hr
Set to 7 hours	
	1
	1
	1
	1
· · · · · · · · · · · · · · · · · · ·	
	1
	1

- (4) If the set time is changed during sleep operation, all data including set temperature, time, etc. is cleared and

(6) If the position of air deflector is being operated using remote control, the operation will be performed at any desired



Notes:

(1) Hot Dash is started when the operation is started at fan speed "AUTO" or "HI" or when the fan speed is changed to "AUTO" or "HI" during heating operation, and when the compressor speed (P item) reaches (WMAX1 or WMAX2) or higher with the room temperature at 8°C or less and outdoor temperature at 10°C or less.

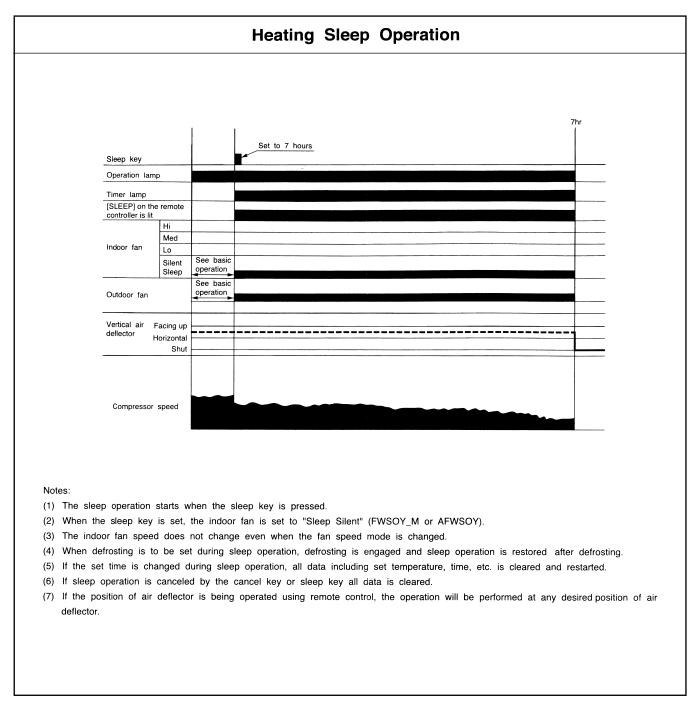
(2) The maximum compressor speed period during hot dash is finished

(1) when the room temperature reaches the heating set temperature (including heating shift) plus SFTDSW or

2 when the thermo is off.

- (3) The thermo OFF temperature during hot dash is heating set temperature (including heating shift) plus 3°C. After thermo OFF, hot dash finishes, and PI control starts.
- (4) The compressor minimum ON time and minimum OFF time is 3 minutes.
- (5) The time limit for which the maximum compressor speed (WMAX1 or WMAX2) during normal heating (except for hot dash) can be maintained is less than 120 minutes when the room temperature is 18°C or more; it is not provided when the room temperature is less than 18°C and outdoor temperature is less than 4°C.
- (6) The operation indicator will blink every second during initial cycle operation, preheating, defrosting (including balance time after defrost is finished), or auto fresh defrosting. However, with duct type models, operation indicator does not blink, but Hot Keep indicator will light.
- (7) For preheating judgment, preheating starts if the heat exchange temperature is lower than YNEOFC and is cancelled if the heat exchange temperature is YNEOF plus 0.33°C or higher at the start of operation using the START / STOP button.
- (8) If the room temperature falls to less than 18°C in the "Ultra-Lo" mode, the indoor fan stops. When the room temperature is 18°C+0.33°C or more, the ultra-Lo operation restarts. However, the ultra-Lo operation during preheating or preheating after defrosting does not stop if the room temperature is less than 18°C.
- (9) Compressor speed is determined by instruction sent from indoor unit and corrected by outdoor unit according to such factors as capacity, fan speed, number of units being operated, outdoor temperature, etc.
- (10) If another indoor unit is doing cooling operation, dehumidifying operation or fan operation, heating operation cannot be done.

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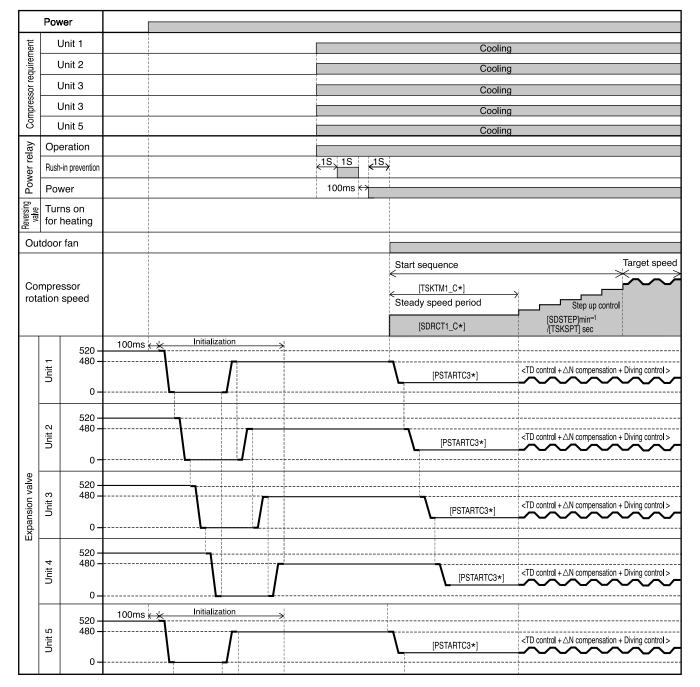
NOTE:

1. Refer to the PWRITE-ZU data for the constats expressed by capital alphabet letters in the drawing.

MODEL RAM-90NP5B

\Diamond Expansion values

- The expansion valves are initialized when power is supplied. The valve for unit 1 is fully closed (-520 pulses), and then that for unit 2 is fully opened (480 pulses). The valve for unit 2 is fully closed (-520 pulses), and then that for unit 3 is fully opened (480 pulses). The valve for unit 3 is fully closed (-520 pulses), and then that for unit 4 is fully opened (480 pulses). The valve for unit 4 is fully closed (-520 pulses), and then that for unit 5 is fully opened (480 pulses). The valve for unit 4 is fully closed (-520 pulses), and then that for unit 5 is fully opened (480 pulses). When the valve for unit 1, 2, 3, 4, 5 is fully closed (0 pulse), start-up is possible.
- The start openings are held during the steady speed period when the compressor is started. After the steady speed period is finished, the TD control is entered. The start openings are set to PSTARTH when the outdoor temperature at start 40°C or more, and to PSTART when it is less than 40°C. PSTART C3 is used for 3 rooms and 4 rooms operation.
- ◇ Compressor rotation speed
 - When the compressor is started, the SDRCT1 speed / TSTKTM1 second is held. (Steady speed period) After the steady speed period is finished, the speed increases at the rate of SDSTEP speed / TSKSPT second until the target speed is reached.



[%] TSKTM1, SDRCT1, SDSTEP, TSKSPT, CMAX2, PSTART and PSTARTH are EEPROM data.

DEFROST

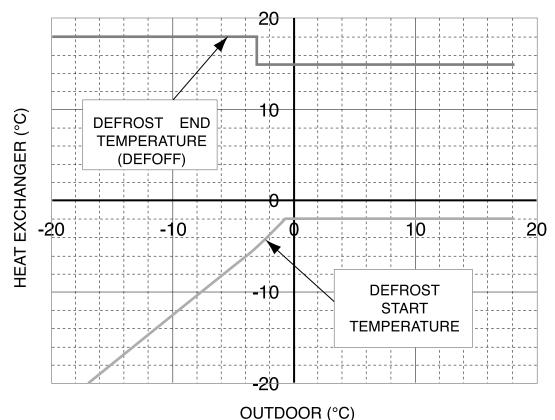
(1) Defrost start condition

- · When all the following conditions are established defrost is executed:
- (1) Normal operation
- (2) Heat exchange temperature is within defrost range specified by outdoor temperature and heat exchange temperature. (Defrost signal occured).
- ③ Defrost inhibit period linked to outdoor temperature has passed.

(2) Defrost release condition

- If any one of the following conditions is established, defrost is released:
- (1) Heat exchange temperature returns (heat exchange temperature \geq DEFOFF).
- (2) Defrost max time of 12 minutes has elapsed.
- Released by condition (1) during balancing period: When remaining balancing period has elapsed, returned to initial condition (ASTUS=0).
- Released by condition (1) or (2) during reversing cycle period: [TDF415] Shifted to balancing period.
- (3) Outputs during defrost
 - Indoor defrost request: Transmitted to all units being operated in heating mode.
 - Compressor : Balancing period for [TDF414] seconds Starting of reversing cycle period by [SDRCT2] min⁻¹ for [TSKTM2] seconds - Accelerating by [DFSTEP]min⁻¹/[TDFSPT] seconds in remaining reversing cycle period until defrost MAX speed [DEFMAX] is reached - Balancing period for [TDF415] seconds
 - · Electric expansion valve
 - Unit being stopped : [FULL CLOSE] 30 seconds after balancing period has passed → [FULL CLOSE] during reversing cycle period → [PCLOSH\$] 15 seconds before balancing period is finished

Unit being operated : [DFCTPS] 30 seconds before balancing period is finished - Synchronized with step-up of rotation speed of compressor, opened by [DFSPPS] pulses and reaches MAX opening degree [DEFSMX] when rotation speed of compressor reaches [DEFMAX].



RAM-90NP5B DEFROST TEMPERATURE

- * above graph is showing the ideal value by micon program.
- * guaranteed temperature range of this model is -15°C to +23°C at heating.

MODEL RAM-90NP5B

• Time chart when executing defrost (Unit 1 and Unit 2 operated, Unit 3, Unit 4 and Unit 5 stopped)

, it	Unit 1							Heatir	ng					Heating										
uireme	U	Jnit 2						Heatir	ng															
Compressor requirement	U	Jnit 3																						
mpres	U	Jnit 4																						
õ	U	Jnit 5																						
Def	rostin	ng signal									 													
ļ,	U	Jnit 1					Defi	rost requ	lest				 1											
opul	U	Jnit 2					Def	rost requ	lest															
est to	U	Jnit 3																						
Request to Indoor	U	Jnit 4																						
		Jnit 5																						
Reversing valve	Turr for	n on heating			30 sec	*						<pre> <[T_4BEN_DEF] </pre>	>											
	Jutdoo			<u>∠15 sec</u>																				
			Defrosting inhibit period	Balancing period	\rightarrow	Reverse	o cycle pe	riod (max	[DFMXTM]))	Balancing	period [TDF415]												
C	ompre	essor	\sim	Defrosting sequence							Start sequence	.e												
rot	tation	n speed		[TSKTM2] [DFSTEP]min ⁻¹ [TSKTM2] [DEFMAX]							[TSKTM1_W*] └──────────													
_		!				[SDRCT2]							[SDRCT1_W*]											
		480 -								[DFPSMX	X\$]	[T_DFCTPS]												
	Unit 1	, I	$ \label{eq:lasses}$	Hold	٦]	[PSTARTH2*]	\sim										
	_	0 -			<u>[[</u>	[DFCTPS\$]) FSPPS\$]	Pulse/[TDFS	PT] sec														
		480 -								[DF	PSMX\$]													
	Unit 2	460 -	$\sim\sim$	Hold								٦	[PSTARTH2*]	_										
	5	0 -				[DFCTPS\$]		[DFSF	PPS\$] Pulse/[[TDFSPT] s	ec			\sim										
alve	$\left - \right $	<u>_</u>		_30 sec																				
ion v	_ س	480 -		Hold																				
Expansion valve	Unit 3	, I						0 Dalaa			[PCLOSH\$]		[PCLOSH\$]	\sim										
ШЩ.		0-		L				0 Palse																
	4	480 -																						
	Unit [∠]	, I	$\vdash \sim \sim$	Hold									[PCLOSH\$]											
		o –		L				0 Palse				/		\sim										
		480 -		< ³⁰ sec→																				
	it 5	400	$\sim\sim\sim$	Hold																				
	Unit							0 Palse				_	[PCLOSH\$]	\sim										
	0-																							

AUTO-FRESH DEFROST

• During heating operation is stopped, and when auto-fresh condition is established, defrost operation will be performed while operation is stopped.

Auto-fresh consists of balancing period at start of defrost for [TDF414] seconds → Reverse cycle period for MAX 12 minutes.

- (1) Start conditions for auto-fresh
 - When all the following conditions are established, auto-fresh is executed:
 - 1 Defrost request signal is present.
 - 2 All indoor units are stopped.
 - (3) 15 minutes of auto-fresh inhibit period has elapsed.
 - (4) Compressor is ON when operation is stopped.
 - $\overline{5}$ Compressor delay command is sent from indoor unit when operation is stopped.
- (2) Release condition of auto-fresh
 - If any one of following conditions is established, auto-fresh is released:
 - (1) Heat exchange temperature returns (heat exchange temperature \ge DEFOFF)
 - (2) 12 minutes of defrost MAX time has elapsed.
 - ③ Failure occurred.
 - $\overline{(4)}$ Either unit 1 or unit 2 or unit 3 or unit 4 started operation.
 - * Released during start of balancing period : Stopped or started after remaining balancing period has elapsed.
 - Released during reverse cycle period : Stopped or started after balancing for 3 minutes.
- (3) Outputs during auto-fresh

[Indoor unit defrost request]: Transmitted only to unit to which auto-fresh is applied (indoor unit stopped last). [Compressor]: Accelerated by DFSTEP min⁻¹/TDFSPT seconds and reaches defrost MAX speed [DEFMAX]. [Electric expansion valve]:

Unit auto-fresh not applied: FULL CLOSE when balancing for 30 seconds has elapsed at start of defrost.

Unit auto-fresh applied : Synchronized with step-up of rotation speed of compressor, opened by [DFSPPS] pulses and

reaches MAX opening degree [DEFSMX] when rotation speed of compressor reaches [DEFMAX].

(4) Note

- Shifted to auto-fresh in defrost mode when operation is stopped.
- All indoor units must be stopped to fulfill condition for auto-fresh.

If signal is delayed, auto-fresh condition will not be established.

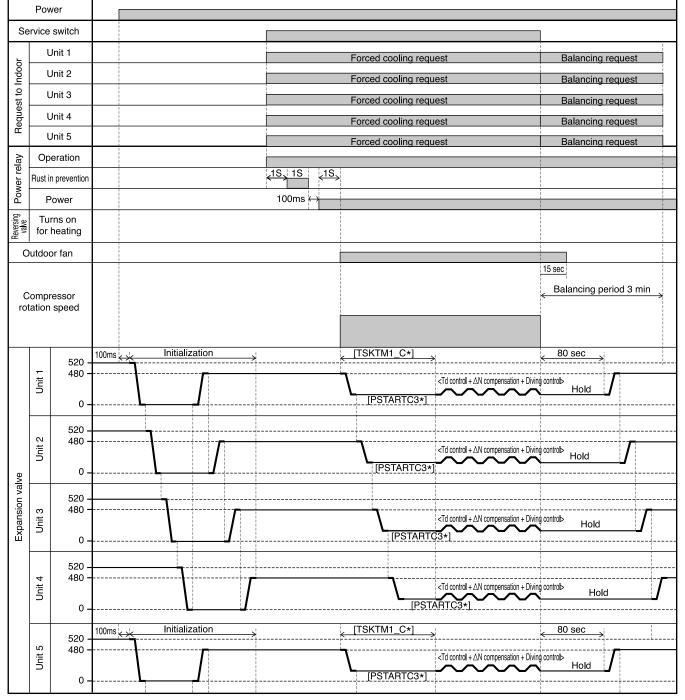
MODEL RAM-90NP5B

art	Unit 1 Heating			Heating		
luireme	U	nit 2	Heating			
Compressor requirement	U	nit 3				
mpres	U	nit 4				
8	S Unit 5					
Def	Defrosting signal					1
۲.	b Unit 1				Defrost request	Balancing request
Request to Indoor	Unit 2					Balancing request
est to	U	nit 3				Balancing request
eque	U	nit 4				Balancing request
Г <u>ш</u>	U	nit 5				
Reversing valve		ns on			15 sec _ 20 ccc	
		heating			30 sec	
	Dutdo	or fan		ter and the second state of the	D Later (TD5// I) Deversing such period (mex/D5AVTAI)	Delegation partial Quein
			<	h inhibit period 15min	Balancing period [TDF414] Reversing cycle period (max[DFMXTM]) Defrosting sequence	Balancing period 3 min.
		essor 1 speed	Target speed	Target speed		
			2 rooms operation	1 room operation		
	1		operation	Tioninoperation	[SDRCT2] /[TDFSPT] sec	_[T_TEISI_OPEN]
	-	480 -				Hold
	Unit 1		$\sim \sim \sim$	$\sim\sim\sim\sim\sim$	Hold [DFCTPS\$] [DFSPPS\$] pulse/[TDFSPT] sec	
		0 -				
		480 -				
	Unit 2				Hold	
		0 -	$\sim\sim$		0 Pulse	Hold
Expansion valve	<u> </u>	480 -				
noist	Unit 3	460 -				
Expar	5		$\sim\sim\sim$	~~~~~	Hold 0 Pulse	Hold
1		0 -				
	4	480 -				
	Unit		$\sim\sim\sim$	~~~~~	Hold	
		0 -			0 Pulse	Hold
		480 -				
	Unit 5				Hold	
		0-			0 Pulse	Hold

MODEL RAM-90NP5B

FORCED COOLING

- In order to accumulate refrigerant, units operate in cooling cycle.
- Execution condition and operation status are shown below.
- [Execution condition]
- With neither indoor unit 1, 2, 3, 4 and 5 not operated, when service switch is turned ON, forced cooling will be performed.
- Always operation status of indoor units are monitored and forced cooling is inhibited when operation of any unit is detected. [Operation status]
- Outdoor unit fan: Fixed in LO.
- Compressor rotation speed: Fixed in 3000min⁻¹.
- Expansion valve/reversing valve : Set in normal conditions.
- [Note]
- During forced cooling, if failure occurs in outdoor unit, thermostat is turned off. However, it is not counted.
- Since rotation speed of compressor is fixed in 3000min⁻¹ during forced cooling, steady speed period of compressor at start is not performed.
- · The following shows the operation state of forced cooling.



☆ TSKTM1_C and PSTARTC2\$ are EEPROM data.

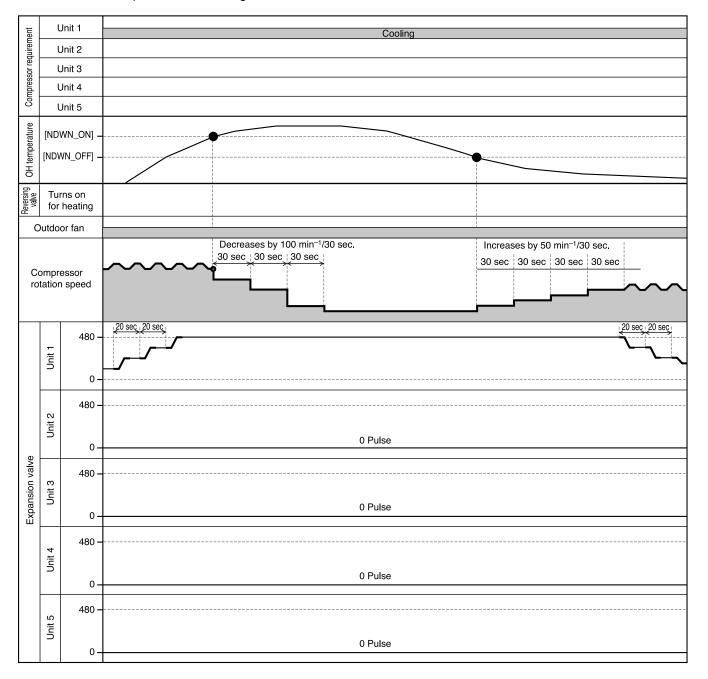
MODEL RAM-90NP5B

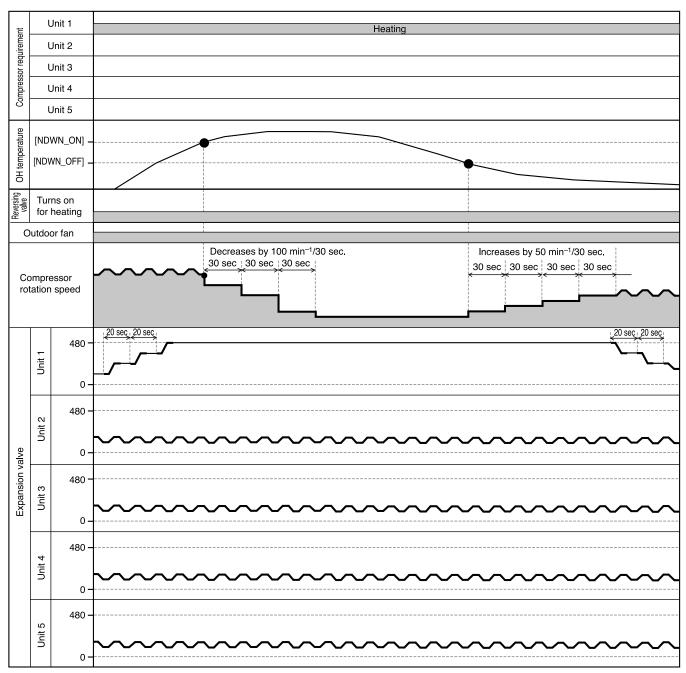
PROCESSING AT OVERHEAT THERMISTOR (OH) HIGH TEMPERATURE

 \bigcirc Restriction Start Conditions

- If any expansion valve is operated at 480 pulses and the OH temperature > [NDOWN_ON], the compressor speed will be reduced at a rate of 100 min⁻¹/30 seconds.
- This reduced rotation speed is based on the speed when the reduction started, and will be maintained until the reduction is finished. However, the reference speed will be exchanged only if the target speed is lower than the speed when the reduction started.
- If [NDOWN_OFF] ≤ OH temperature ≤ [NDOWN_ON] and the OH temperature does not rise from that 20 seconds before, the reduction of compressor speed will not occur.
- \bigcirc Restriction Release Condition (in common for all)
 - The restriction will be released when OH temperature < [NDOWN_OFF], and the compressor speed will be increased at a rate of 50 min⁻¹/30 seconds to restore the target speed.

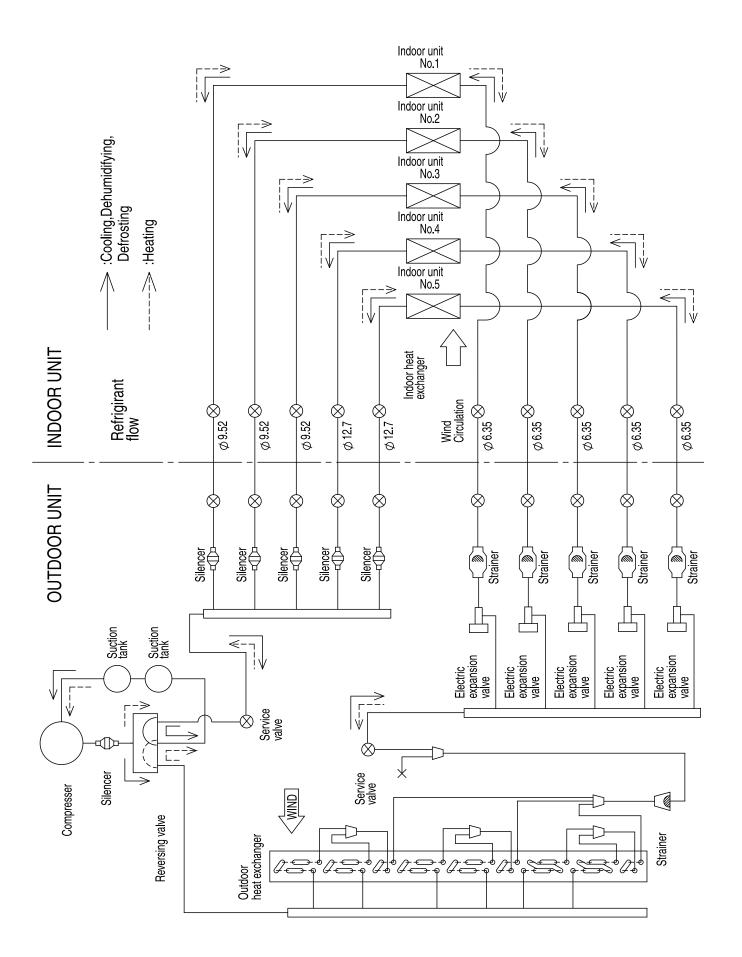
When one unit is operated for cooling





When one unit is operated for heating

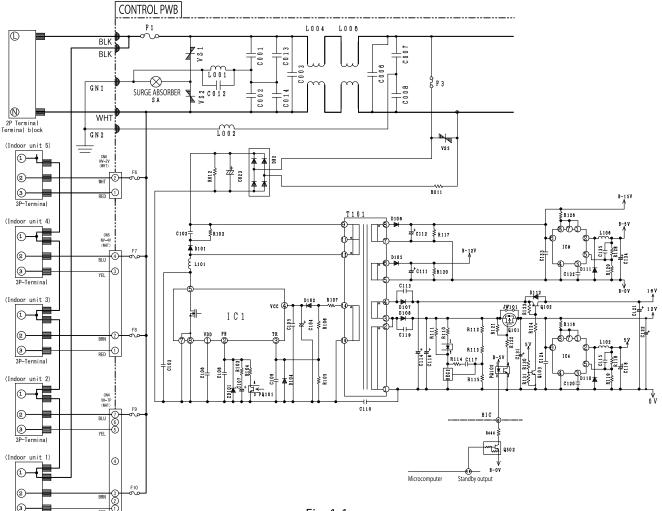
MODEL RAM-90NP5B



DESCRIPTION OF MAIN OPERATION CIRCUIT

RAM-90NP5B

1. Control Power Supply Circuit





- AC 220~240V power supplied to the 2P terminal block is supplied to DB2 via the noise filter circuit, 2A fuse (F3), and varistor (VS5). High-voltage DC smoothed by DB2 and C023 is used to create DC voltage on the transformer's secondary side by the switch control IC (IC1) and switching transformer.
- Secondary side DC voltage is used in the following six systems:
- (1) B-15V : Power supply for indoor and outdoor communication circuits
- (2) B-5V : Power supply for control microcomputer and peripheral circuits
- (3) B-12V : Operating power supply for electric expansion valve
- (4) 16V : Power supply for compressor motor drive IPM and fan motor drive IPM
- (5) 12V : Power supply for reversing valve relay, cooling/heating switching relay, power relay, rush prevention relay, and operating amplifier for compressor motor and fan motor current amplification
- (6) 5V : Power supply for inverter microcomputer and peripheral circuits
- Primary Components
- (1) C001, C002, C013, C014, C007, C008, L004, L006
 - Absorb electrical noise generated during operation of the compressor, and reduce noise level emitted to the power line.
- (2) Surge absorber, varistor 1, 2, 5
- Absorb external surges, such as induced lightning.
- (**3**) IC1
 - IC for control of switching power.

(**4**) IC4

- DC/DC converter IC for generating 5V from 12V.
- (5) IC9
 - DC/DC converter IC for generating B-5V from B-15V.

 Inverter Microcomputer Power Control The power to the inverter microcomputer is turned ON/OFF by commands from the control microcomputer. Q502, PQ102, Q101, and Q102 are related.

Output Name	Voltage Specification	Primary Load	\pm Measurement Location	Examples of Possible Failure Modes for Output Failures (for Reference)
B-15V output	15.5 ±1.5 V	Indoor/outdoor communication		LD401 (green), LD402 (green) do not light or blink.
B-12V output	12 ^{+4,-2} V	Expansion valve	Tester ⊕ terminal: B-12V indicator (J21) Tester ⊖ terminal: B-0V indicator (J20)	LD351 (red) blinks 5 times and stops.
B-5V output	5 ±0.4 V	Control microcomputer thermistor	Tester ⊕ terminal: B-5V indicator (J27) Tester ⊖ terminal: B-0V indicator (J20)	LD353 (green) does not blink. LD351 (red) does not blink. Outdoor unit does not operate.
5V output	$5^{\pm0.4}V$	Inverter microcomputer	Tester ⊕ terminal: 5V indicator (J23) Tester ⊖ terminal: 0V indicator (C601)	LD351 blinks 8 times.
12V output	12 ^{±1} V	IC2, 3, 4 relay circuits	Tester ⊕ terminal: 12V indicator (J19) Tester ⊖ terminal: 0V indicator (C601)	LD351 blinks 8 times.
16V output	15.5 ^{±1.5} V	Compressor IPM DC fan drive circuit Converter circuit	Tester ⊕ terminal: 16V indicator (J18) Tester ⊖ terminal: 0V indicator (C601)	LD351 blinks 3, 4 or 12 times and then stops.

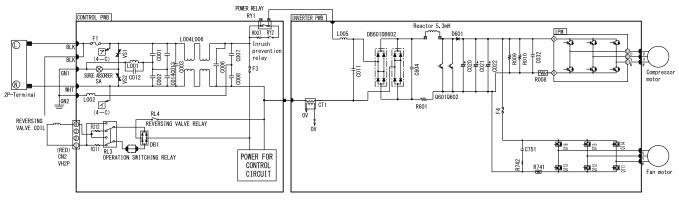
• Specifications and Checkpoints for Control Power Supply Circuits

 Check each voltage. If the above specifications are satisfied, the control power supply circuit can be considered normal.

• Due to high voltage, be particularly careful to avoid electric shock. Further, take care to avoid short-circuit accidents caused by incorrect connection of measuring instruments. Otherwise, the board could be damaged.

• Even after the power is turned off, an electric charge remains in the smoothing capacitor, and a voltage of 270V to 360V is applied between the terminals of the smoothing capacitor.

2. Converter Circuit

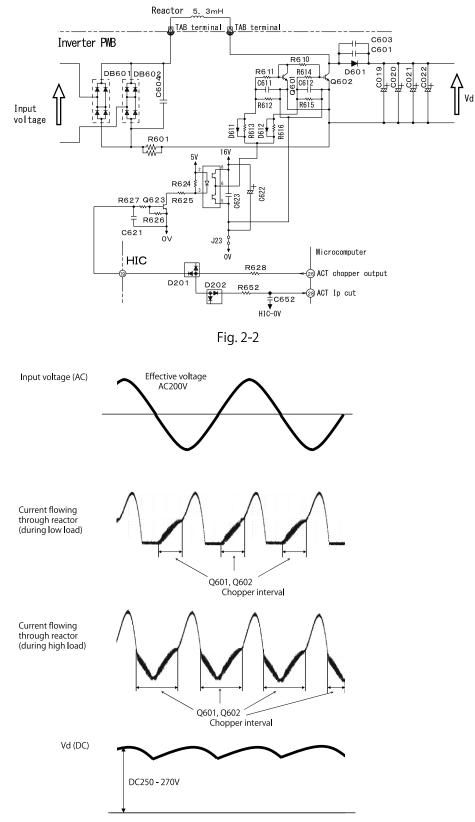




- This circuit rectifies the AC220~240V between L and N on the 2P terminal block, and creates a DC voltage. During operation of the compressor, the rectified circuit voltageis approximately (DC320V - 360V).
- Primary Components
- (1) Intelligent Power Module (IPM) used for configuration of inverter section.
- Reference:
- In case of IPM failure or poor connection, immediately after starting the compressor, it might stop due to abnormal speed reduction, switching failure, Ip cut, etc.
- Reference:
- (2) Diode bridge (DB1, DB601, DB602)Rectifies AC200V between terminal blocks① and ② into DC.
- If there is a failure in the diode bridge (DB601, DB602),
 DC voltage is not generated and operation might not occur.

(3) Smoothing Capacitor (C019~022, 500µF, 450V)

Boosts and smoothes (averages) voltage rectified by the diode.



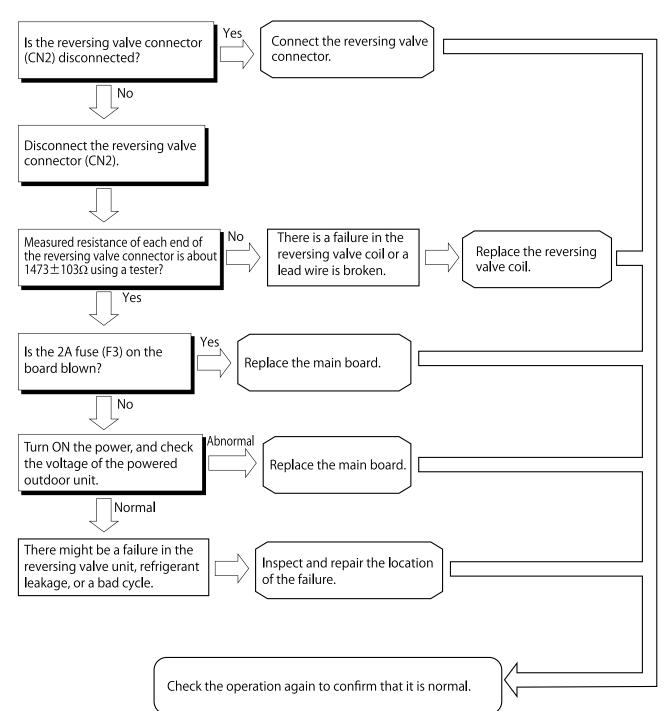


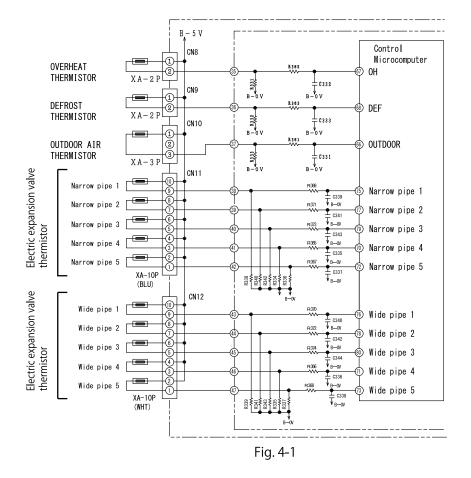
(4) IGBT for improving power factor (Q601, Q602)

When load on the compressor increases, the power factor is improved by applying current to the chopper interval between Q601 and Q602 shown in Fig. 2-3.

Inspection when Timer Lamp on Indoor Unit Blink Once

Note: Be sure to turn the power OFF before performing the following inspection.





- The OH thermistor circuit detects compressor head surface temperature, the DEF thermistor circuit detects defrost operating temperature, and the outside air temperature thermistor circuit detects the outside air temperature. In addition, the electric expansion valve thermistor (narrow pipe 1) detects the temperature of narrow pipe going to indoor unit 1 and (wide pipe 1) detects the temperature of the wide pipe going to indoor unit 1. (Narrow pipe 2) and (wide pipe 2) are for indoor unit 2.
- Thermistors are negative resistance elements. The resistance value grows smaller as the temperature rises, and grows
 larger as the temperature falls.
- If the compressor overheats, the resistance value of the OH thermistor grows smaller. B-5V is divided between the OH thermistor and R331, and therefore the voltage of pin (1) on the control microcomputer rises.
- The voltage of pin (1) on the control microcomputer is compared with the value set and stored internally. If the set value is exceeded it is determined that the compressor has overheated, and operation is stopped.
- If frost accumulates on the outdoor heat exchanger, the temperature of the heat exchanger will fall rapidly. Therefore, the resistance value for DEF thermistor grows large and the voltage of pin (8) on the microcomputer falls. If this voltage drops below the value set and stored internally, defrosting of the control microcomputer will start.
- Outdoor temperature is read by the outdoor temperature thermistor (voltage of pin 66 on the microcomputer). Commands from the indoor microcomputer, values read from the outdoor temperature thermistor, and values read fro the OH thermistor are taken into account to control the speed of the compressor and the speed of the outdoor fan. Typical values that indicate the relationship between outdoor temperature and voltage are shown below.

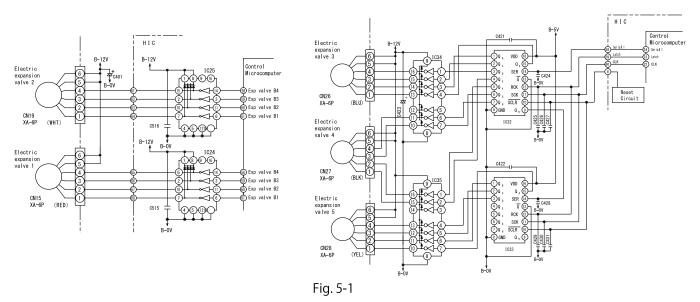
āb	le	4-1	

Outdoor temperature (C)	—10	0	10	20	30	40
Voltage (V) at both ends of R333	1.19	1.69	2.23	2.75	3.22	3.62

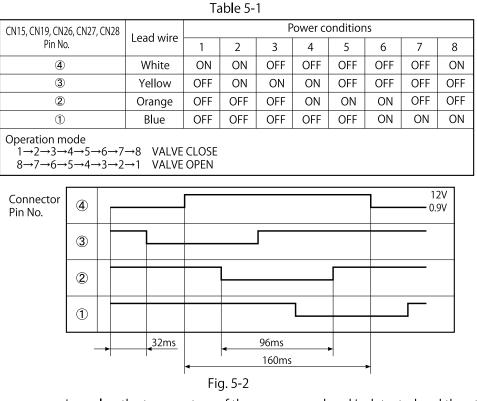
The temperatures at narrow pipe 1 - 5 and wide pipe 1 - 5 are read by thermistors, and the amount that electric expansion valves 1 - 5 are opened is changed to control the distribution of refrigerant.
Reference:

When a thermistor is open and disconnected, pins 66 - 68, 70, 71, and 73 - 80 on the control microcomputer are approximately 0V. When there is a short-circuit in a thermistor, these pins are approximately 5V, LD351 lit, and LD352 blinks. The number of blinks by LD352 indicates the thermistor in question. However, if a short-circuit error occurs in the OH thermistor, blinking mode starts 12 minutes after the compressor starts operating.

5. Electric Expansion Valve Circuit



- There are 5 electric expansion valves for indoor units 1-5.
- The electric expansion valves are powered by B-12V for expansion valves. 1- or 2-phase current is applied to 4-phase wound wires, switching the poles of the wound wires to control valve openings.
- The relationship between the switching direction of the current phase and the open/close direction of the valves is shown in the following table. When current is applied, approximately 0.9V passes through pins ①-④ of CN15, CN19, CN26, CN27 and CN28; when no current is applied, it is approximately 12V. When the power is reset, the expansion valve is initialized for approximately 35 seconds. During initialization, use a tester to measure pins①-④ on CN15, CN19, CN26, CN27 and CN28. If there is a pin that does not change at approximately 0.9V or 12V, there is an abnormality in that expansion valve or the control microcomputer.
- The logic waveform for when an expansion valve operates is shown in Fig. 5-2.



When controlling an expansion valve, the temperature of the compressor head is detected and then the opening is adjusted to stabilize the valve to the target temperature.

This control cycle is performed once every 20 seconds, and a few pulses are output.

- Two (IC32, IC33) 8-bit type shift register ICs that convert serial signal input to parallel and output the parallel signals are used on the circuits of electric expansion valves 3,4 and 5.
- An example of circuit operation when an expansion valve is powered is shown in the time chart in Fig. 5-3.
 A clock signal (16 cycles at 750µs/cycle) is output from pin ⁽²⁾ on the microcomputer. (One cycle for the clock signal is 500µs off, 250µs on.)
 - ② A serial signal #1 of the power pattern is synced with the clock signal and output from pin ④ of the microcomputer.
 - #1 The serial signal is the pattern of the current applied to phase 1 or phase 2 of a 4-phase wound wire on an expansion valve, that has then been converted to serial format. A serial signal is output so that the center of the ON serial signal (Hi-level 500μs) aligns with the rising edge of the clock signal.

The content of the shift register in IC is updated by operations (1) and (2) described above.

Next, 250µs after the ON signal is output for the 15th cycle of the clock signal,

(3) the latch signal from pin(2) on the microcomputer is turned OFF (Lo-level 500µs) and then ON again (Hi-level).

④ After the time required to apply current has elapsed, if powering of the expansion valve is required the cycle returns to ① and repeats the operation.

With the operation described above, the opening of expansion valves is controlled while applying current to phase 1 or phase 2 of a 4-phase wound wire on an expansion valve, according to the content of the shift register updated when the current is applied. When the opening of the expansion valve reaches the target amount, the stop pattern described in (2) above is applied and then operations (1) - (4) are performed to complete the control of the expansion valve.

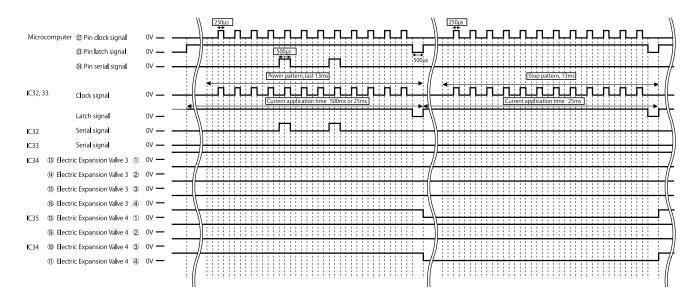


Fig. 5-3 Time Chart

6. Outdoor Fan Motor Control Circuit

• This outdoor unit is equipped with a built-in outdoor fan motor control circuit.

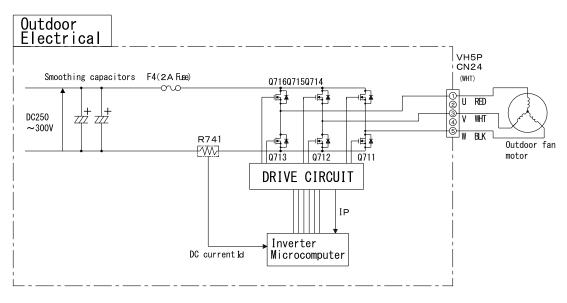


Fig. 6-1

Based on operation commands from the indoor microcomputer, the speed of the outdoor fan motor on this unit is determined by the control microcomputer and controlled by the inverter microcomputer.

Actual speed is estimated based on DC waveforms from R741 to control the speed so that it matches the operational commands.

Overcurrent and other failures in the outdoor fan motor are detected by the magnitude of the direct current.

(1) Control of outdoor fan motor at startup

If the propeller fan is already rotating at the start of operation, due to disturbances such as strong wind, operational behavior will vary according to the direction and speed of such rotation as described below. Favorable wind is defined as wind that blows outward from the mouth ring.

Strong headwind	: Control is not performed, to protect the equipment, and the propeller is blown in the
	opposite direction by the wind. The unit starts automatically once the wind has weakened.
Headwind	: After the speed reduces gradually and finally stops, the speed is controlled in the normal
	direction.
Favorable wind	: The speed of the fan is controlled normally.
Strong favorable wi	nd : Control is not performed, to protect the equipment, and the propeller is blown in the
	normal direction by the wind. The unit starts automatically once the wind has weakened.

(2) Control of outdoor fan motor during operation

The speed of the propeller fan might drop during operation of the outdoor fan motor due to disturbances such as strong wind.

If such conditions continue for a long period of time, the propeller fan will stop. (Self-diagnosis lamp LD351: Blinks 11 times)

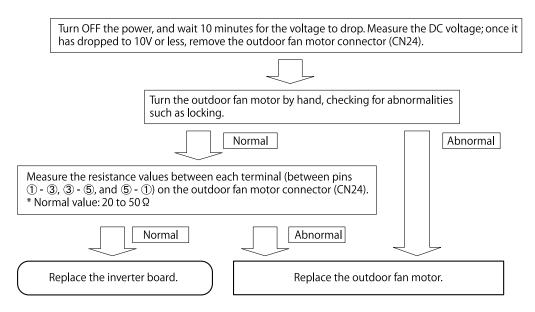
When the fan is restarted, the operation described in (1) above is used.

(3) Confirmation method when self-diagnosis lamp LD351 blinks 12 times

If LD351 on the control board blinks 12 times (fan lock detected) and operation stops, use the following procedure to check the unit.

- 1. Mechanical locking caused by the insertion of foreign objects such as sticks into the propeller fan or freezing due to the accumulation of snow will cause fan lock to be detected and result in shutdown. Remove any foreign objects.
- 2. Check whether CN24 is securely inserted. A poor connection will cause a fan lock detection and result in shutdown. If CN24 is loose, insert it securely.
- Strong wind around the outdoor unit might cause a fan lock detection.
 Check if the unit restarts. (Several minutes might be required for the unit to restart.)
 If the unit continues to operate after restarting, there is no failure in the outdoor fan motor or electrical components.
- 4. Perform a check of the outdoor fan motor. The procedure is shown below.

Procedure for Checking the Outdoor Fan Motor

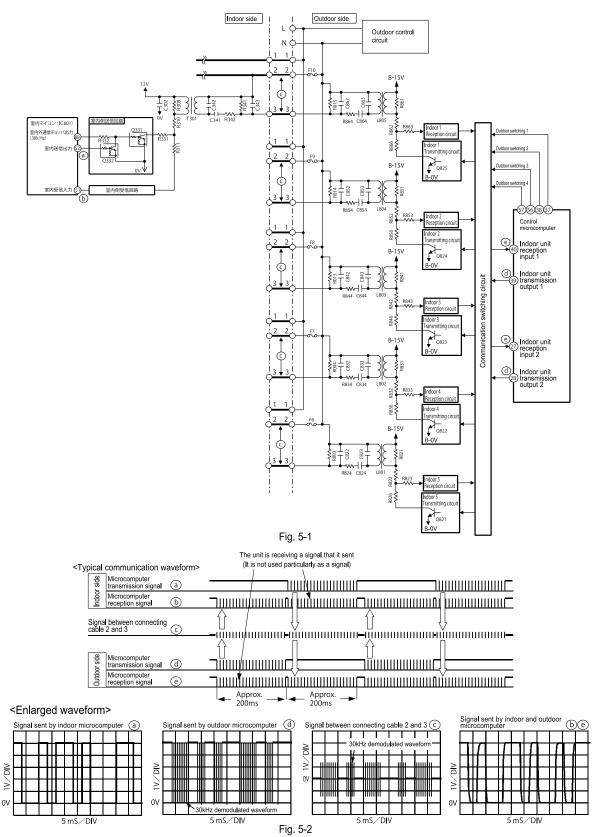


5. Insert the outdoor fan motor connector (CN24).

* Also use the above procedure if F4 (2A fuse) is blown.

Caution

* The power supply for the outdoor fan motor is also used as the power supply for the compressor, and therefore has a high voltage (DC280 to 340V). Use sufficient caution to avoid electric shock when checking operations and performing repairs.



* Indoor and outdoor communications are conducted by using lines 2 and 3 of connecting cable. Line 2 of connecting cable is share with a transmission channel that powers the indoor unit.

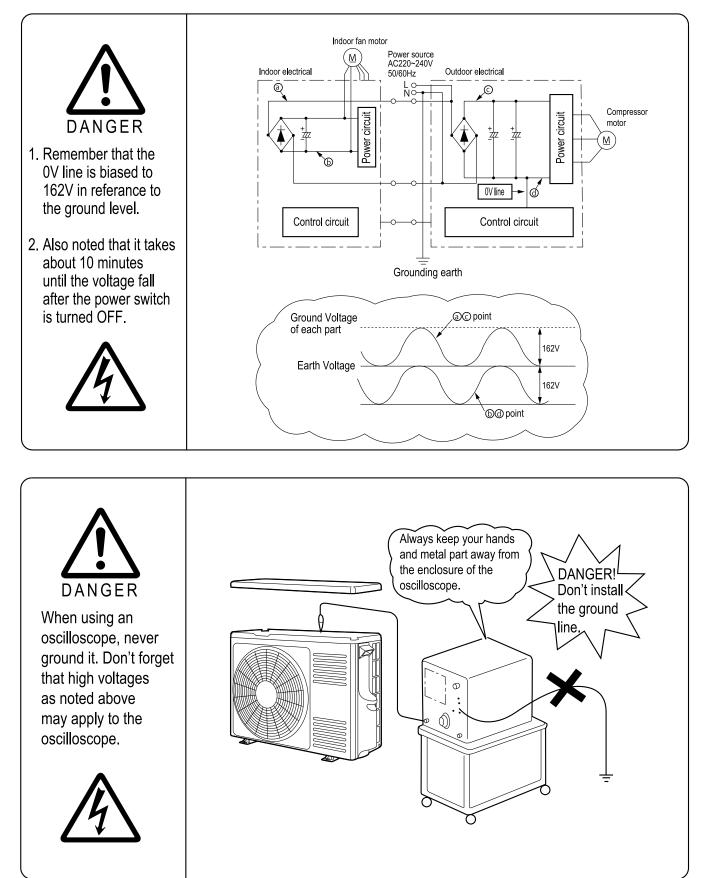
* Data communicated between the indoor and outdoor units are outputted from the microcomputer as serial signals and are transmitted as demodulated by a 30kHz carier wave.

Check

If the communication fails between the indoor and outdoor units for some reason, the product will give a self-diagnosis display either by "the timer lamp blinking 3 times" or "the the timer lamp blinking 12 times" depending on the cause.



PRECAUTION FOR CHECKING



SELF CHECK

When it is difficult to judge whether the compressor or the electrical part is faulty resulting self diagnosis lamp blink 2,3,4 or 5 times, please confirm first the compressor terminal insulation by using mega ohm checker. If the insulation is normal, proceed to below self-check method.

Self-check diagnosis method

- 1. Switch OFF main power supply. (Wait until DC voltage fully discharged :15 minutes or more)
- 2. Un-insert jumper wire connector at CN30.
- 3. Switch ON main power supply. (LD352 will blink 1 time)
- 4. Press and hold TEST SWITCH for more than 1 second.
- It energizes to IPM and the compressor motor one by one, and the short-circuit and opening are confirmed.
- 5. Self-check diagnosis result will appear.
 - •The content of diagnosis result shall refer to below table.

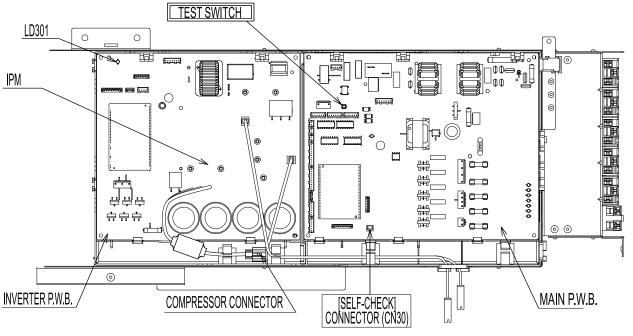
Self-check diagnosis result

[[SELF-CHECK] DIAGNOSIS RESULT						
LD301	DIAGNOSIS CONTENT	REPAIR METHOD					
1 TIME BLINK	ELECTRICAL OK.	CHANGE COMPRESSOR.					
2 TIMES BLINK	PEAK CURRENT CUT OFF SIGNAL DETECTED.	CHANGE INVERTER P.W.B.					
7 TIMES BLINK	COMPRESSOR CURRENT ABNORMAL.	COMPRESSOR CONNECTOR LOOSE=>CHECK CONNECTOR. AFTER CHECK COMPRESSOR CHANGE INVERTER P.W.B.					
10 TIMES BLINK	DC VOLTAGE ABNORMAL.	AC VOLTAGE ABNORMAL (BEYOND RATED ±10%) CONNECT WITH CORRECT AC VOLTAGE. AC VOLTAGE NORMAL (WITHIN RATED ±10%) CONNECTOR (0X23,0X25) BAD INSERTION ⇒ CHECK CONNECTOR OTHER ⇒ CHANGE BOTH MAIN & INVERTER P.W.B.					
13 TIMES BLINK	EEPROM READING ERROR.	CHANGE INVERTER P.W.B.					

In case abnormality found at the checking result, please confirm the connecting cord having problem or not before replace the defect part according to the table of self-check diagnosis result.

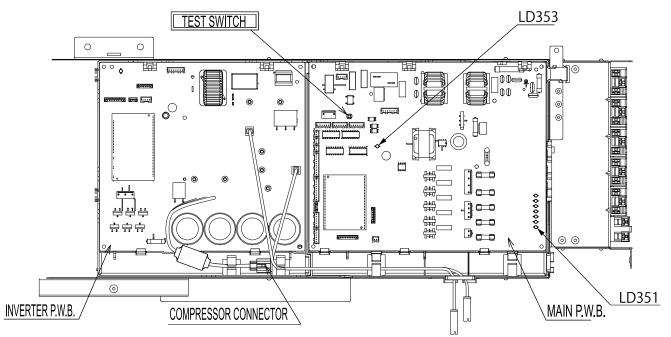
In case no abnormality found at electrical part, insert back the jumper wire connector at CN30 as original condition before it can be use.

* If forgot to insert back as per original condition, the system will not operate until 3 minutes has lapsed after restore the power supply.



Collect refrigerant using test switch operation

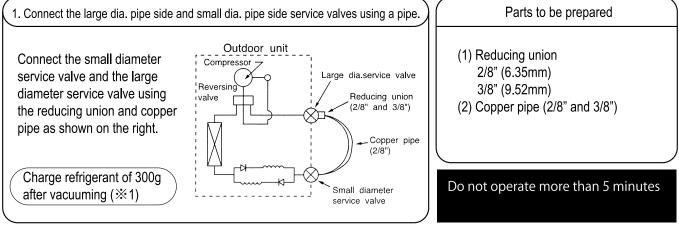
- 1. Turn OFF the breaker and wait for 1 minute or more before turn ON back the breaker.
- 2. Detach the electrical cover of outdoor unit and ensure LD353 is blinking once.
- 3. Wait 20 seconds or more before pressing the test switch for 1 second or more to start the forced cooling operation.
- 4. Pressing the test switch again for 1 second or more will stop the opeartion.



※ Cautions

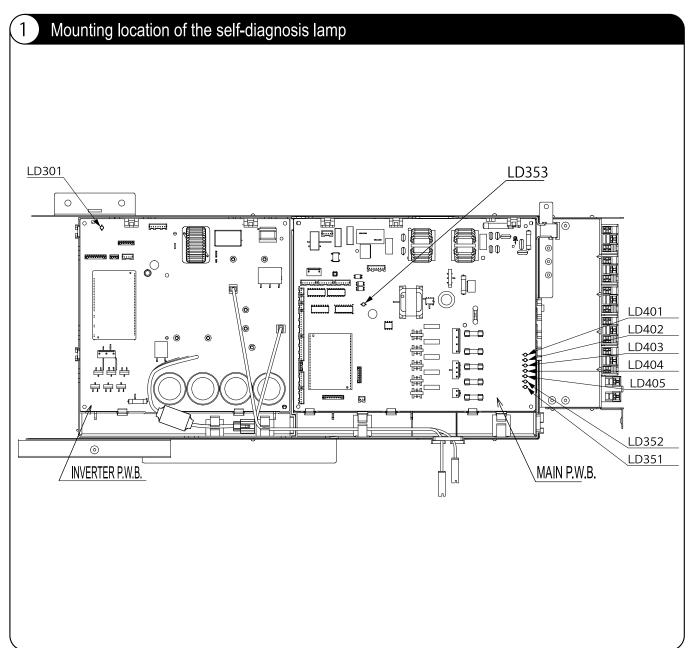
- 1. Do not any circumstances operate the outdoor unit for more than 5 minutes.
- 2. Doing work with the compressor connector removed will cause the LD351 to blink 4 times. It will not start the operation.
- 3. For another test run, turn OFF the breaker and turn it back ON to reset the power supply. (The test switch is accepted only once after power ON. After operation by remote controller, it is not accepted.)
- 4. When the operation with the test switch is done, turn OFF the breaker.

How to operate the outdoor unit indipendently

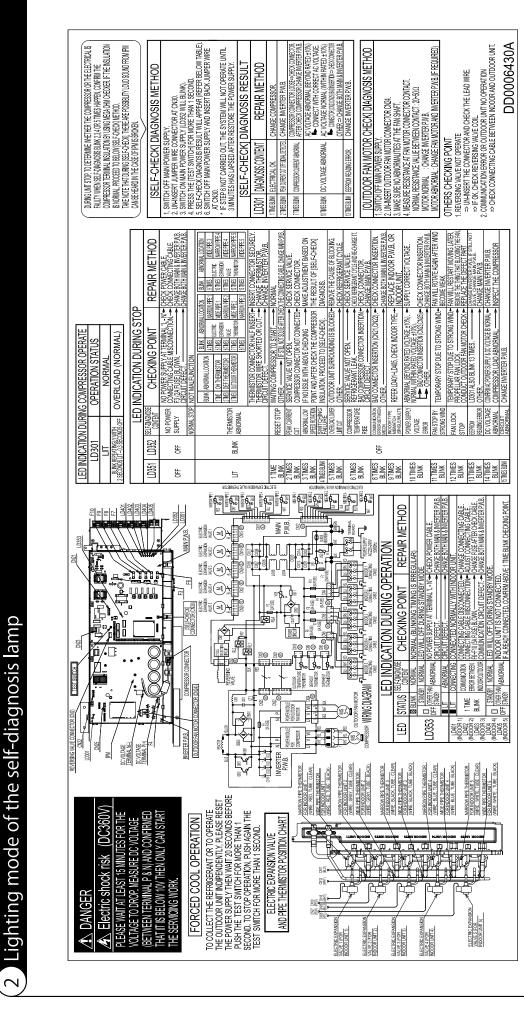


The operation method is the same as "Collect refrigerant using test switch". ※1 The charging amount of 300g is equivalent to the load in normal operation.

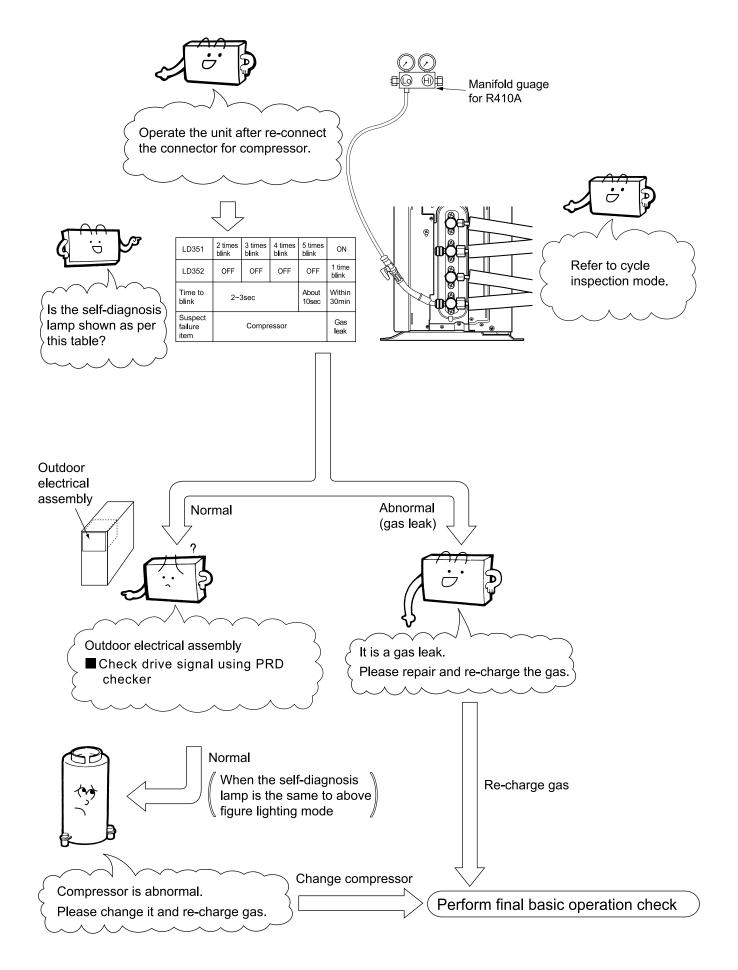
Lighting mode of the self-diagnosis lamp

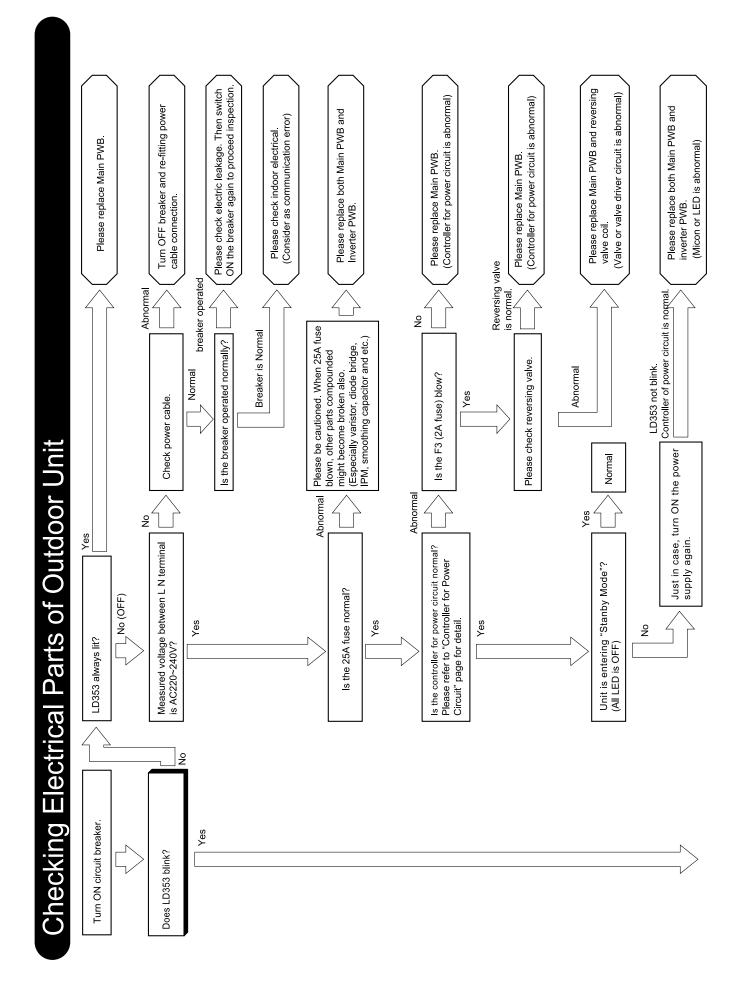


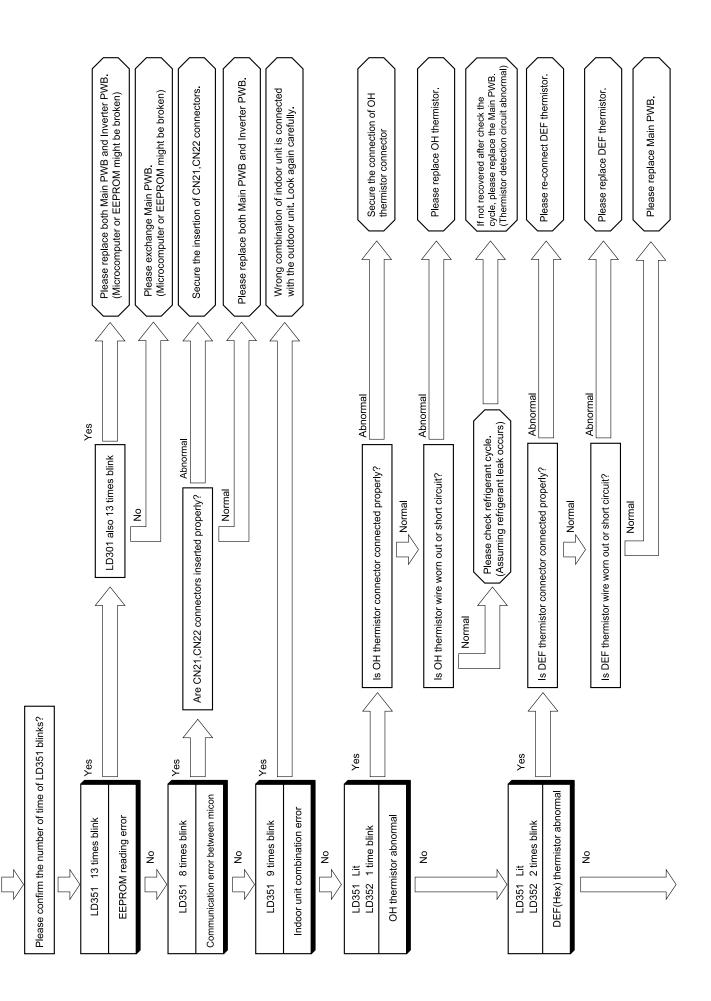
Lighting mode of the self-diagnosis lamp

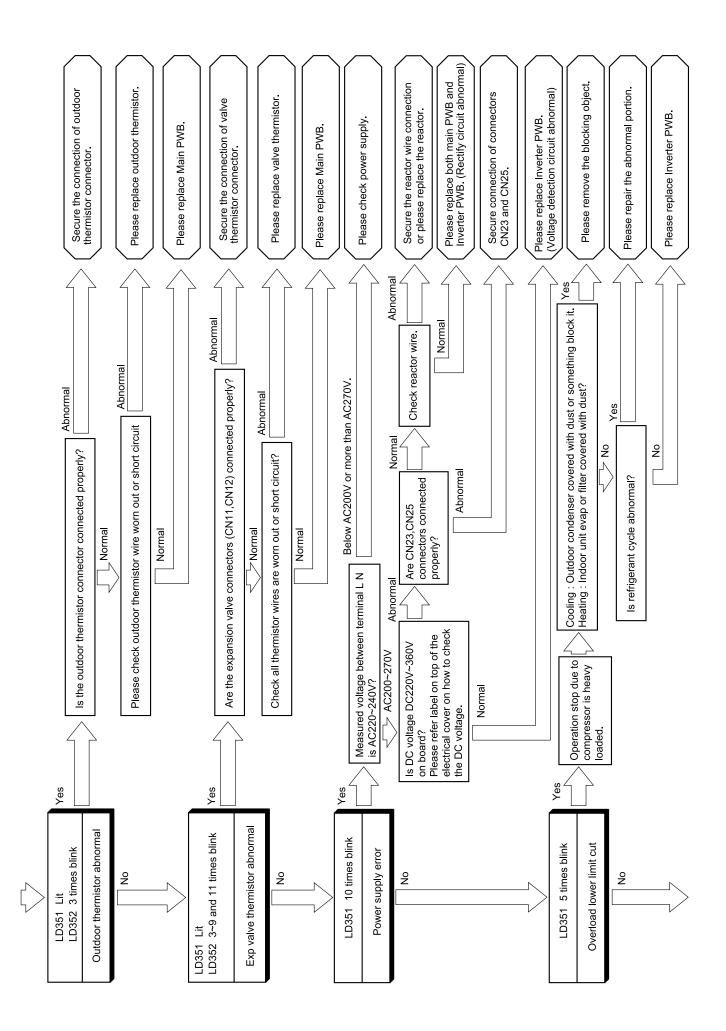


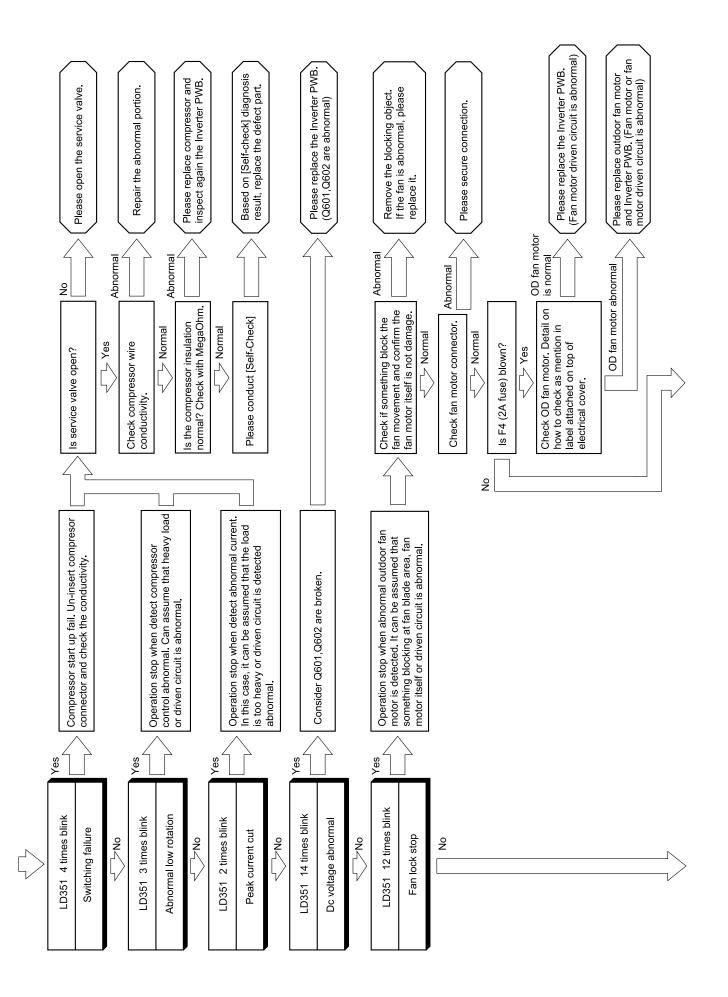
Refrigerant cycle check (gas leak or compressor failure)

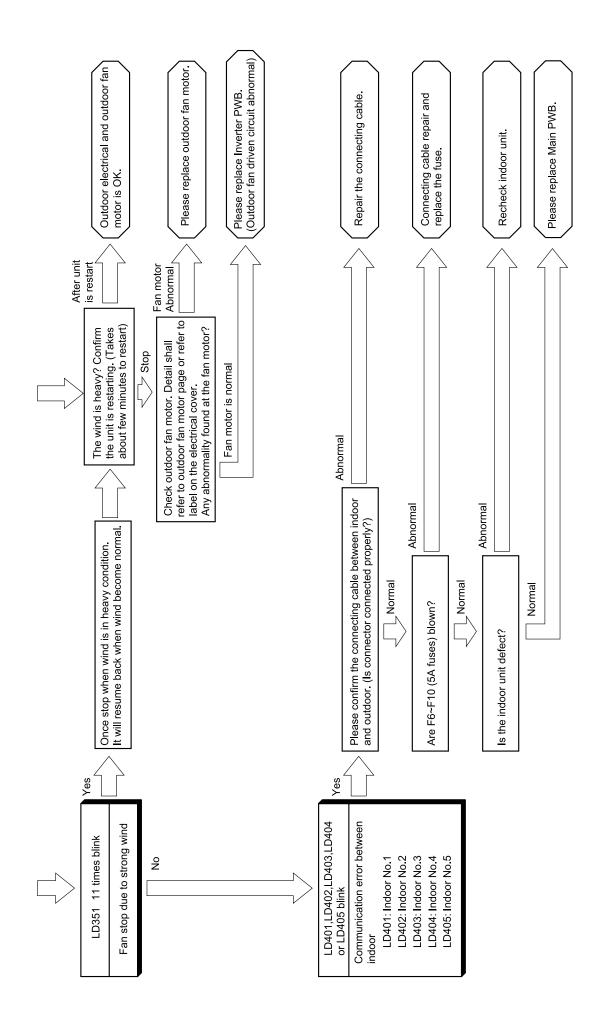






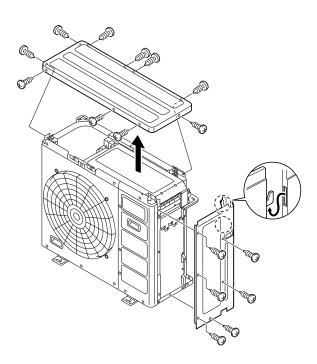






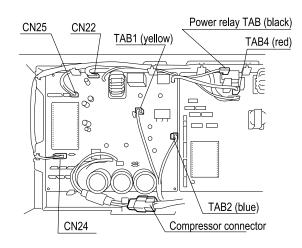
DISMANTEL AND ASSEMBLY PROCEDURE ■ RAM-90NP5B

- 1. Electrical parts (preparation to remove board)
- (1) Remove screw that fix the service valve cover and push it down to take it out.
- (2) Remove the screws on both sides of top cover and then remove the top cover.

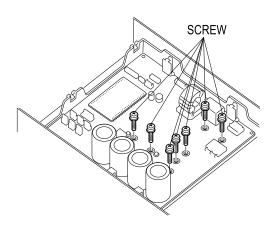


(2) Remove the screws that holding the electrical cover and then remove the cover.

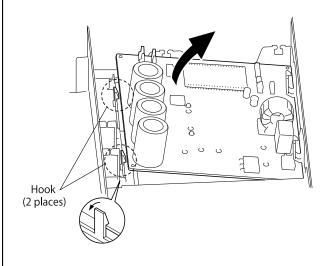
- 2. Dismantel procedure of inverter board
- (1) Un-insert connectors (4 places) and TAB terminal (4 places).



(2) Remove screw (7 pieces) that fixed the board.

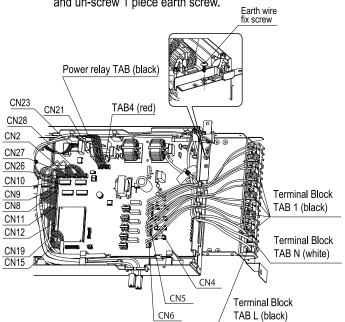


(3) Take out the board by lift up in arrow direction after release the hook that hold the board in its place.

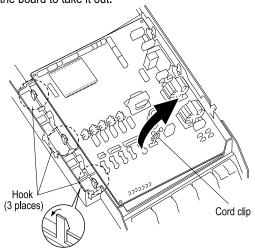


3. Dismantel procedure of main board

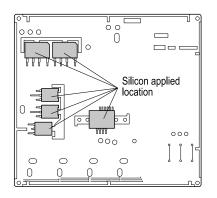
(1) Un-insert connector (14 places), TAB terminal (5 places) and un-screw 1 piece earth screw.



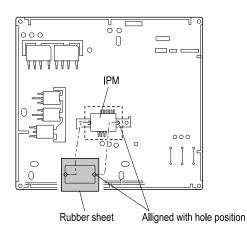
(1) Release the hooks (3 places) that locking the board and by holding the cord clip lift up in arrow direction the board to take it out.



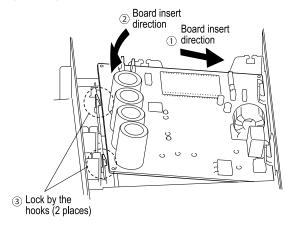
- 4. Assembly procedure of inverter board
- (1) Preparation before insert back the board.
 - (i) Applied uniformly with small amount to 6 places of electronic part at back side of board.



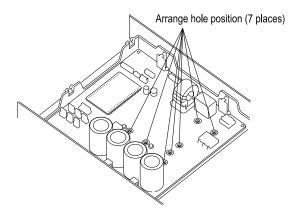
(ii) Attach the silicon rubber to the IPM body. Arrange so that the holes of silicon rubber and the holes of IPM are concentric.



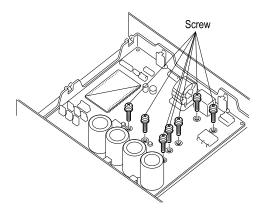
(2) Insert the board into the pcb support and fix it with hooks (2 places).



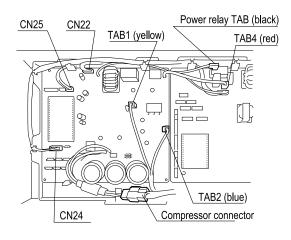
(3) Arrange the board position so that hole for fixing screw and holes at heat sink are concentric.



(3) Fix the board with screw (7 places).

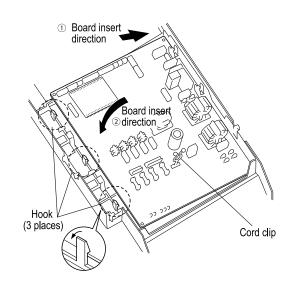


(3) Insert back connector (4 places) and TAB terminal (4 places) at it original location.

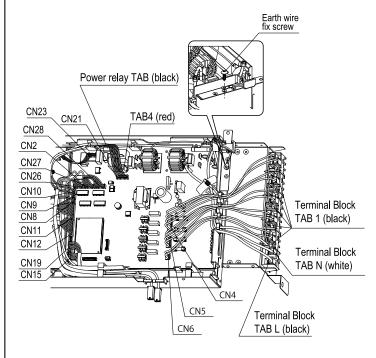


5. Assembly procedure of main board

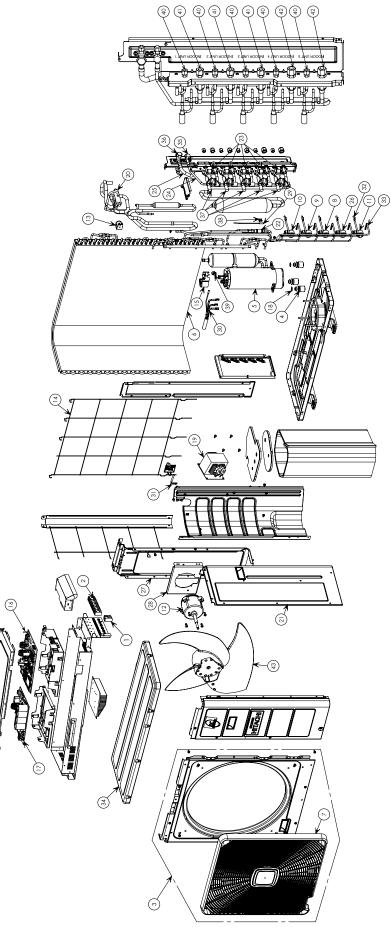
(1) Insert back the board into pcb support and lock it with hook (3 places).



(2) Insert back the connectors (16 places), TAB terminals(9 places) and 1 piece of earth screw.



PARTS LIST AND DIAGRAM OUTDOOR UNIT MODEL : RAM-90NP5B



MODEL RAM-90NP5B

NO.	PART NO. RAM-90NP5B		Q'TY / UNIT	PARTS NAME
1	PMRAC-63CA1	S02	1	2P TERMINAL
2	PMRAC-VX13CET S04		5	3P TERMINAL
3	PMRAM-90NP5A	S02	1	CABINET
4	RAC-2226HV	805	3	COMPRESSOR RUBBER
5	PMRAM-90NP5B	S15	1	COMPRESSOR
6	PMRAM-90QH5	904	1	CONDENSER
7	PMRAM-90QH5	905	1	D-GRILL
8	PMRAM-90NP5B	S05	1	EXPANSION VALVE COIL (B)
9	PMRAM-90NP5B	S04	1	EXPANSION VALVE COIL (R)
10	PMRAM-90NP5B	S03	1	EXPANSION VALVE COIL (W)
11	PMRAM-90NP5B	S06	1	EXPANSION VALVE COIL (BC)
12	PMRAM-90NP5B	S08	1	FAN MOTOR
13	PMRAM-90NP5B	S09	1	MG-COIL (REVERSING VALVE)
14	PMRAC-70YHA	S06	1	NET
15	PMRAC-25NH4	910	1	OLR COVER
16	PMRAM-90NP5B	S01	1	P.W.B (MAIN)
17	PMRAM-90NP5B	S02	1	P.W.B (INVERTER)
18	KPNT1	001	3	PUSH NUT
19	PMRAC-X18CD	S04	1	REACTOR
20	PMRAC-S18CPA	S02	1	REVERSING VALVE
21	PMRAM-90QH5	914	1	SIDE PLATE R
22	PMRAM-90QH5	915	1	STRAINER (CO-PIPE-AS 1)
23	PMRAM-90QH5	916	1	STRAINER (ST-PIPE-AS)
24	PMRAM-90QH5	917	1	3S PIPE-AS
25	PMRAM-90QH5	918	1	5S PIPE-AS
26	PMRAM-90NP5B	S07	1	EXPANSION VALVE COIL Y
27	PMRAM-90QH5	919	1	SUPPORT (FAN MOTOR)
28	PMRAM-90QH5	920	1	FAN MOTOR BRACKET
29	PMRAM-90NP5B	S10	1	THERMISTOR (DEFROST)

NO.	PART NO. RAM-90NP5B		Q'TY / UNIT	PARTS NAME
30	PMRAC-80YHA	S14	1	THERMISTOR (OH)
31	PMRAM-90NP5B	S11	1	THERMISTOR (OUTSIDE TEMPERATURE)
32	PMRAM-90NP5B	S12	1	THERMISTOR-PIPE (W)
33	PMRAM-90NP5B	S13	1	THERMISTOR-PIPE (N)
34	PMRAM-90QH5	926	1	TOP COVER
35	PMRAM-90QH5	927	1	VALVE (3S)
36	PMRAM-90QH5	928	1	VALVE (5S)
37	PMRAM-90NP5B	S14	5	EXPANSION VALVE
38	PMRAM-65QH4	S07	1	SUPPORT (DEF-THERMISTOR)
39	PMRAC-25NH4	S09	1	SUPPORT (OH-THERMISTOR)
40	PMRAM-90QH5	S33	5	2 UNION
41	PMRAM-90QH5	S34	3	3 UNION
42	PMRAM-90QH5	S35	2	4 UNION
43	PMRAM-90NP5A	S03	1	PROPELLER FAN

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