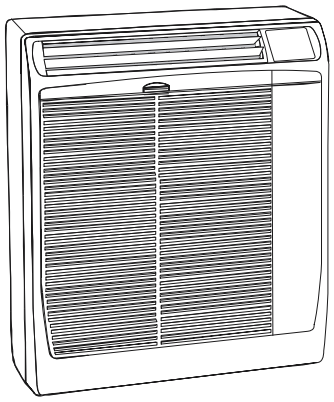
TECHNICAL DATA
& SERVICE MANUAL

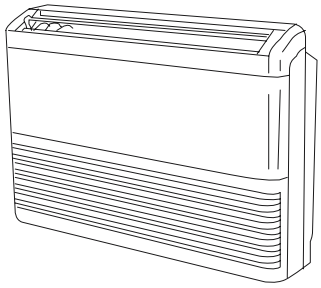
INDOOR UNIT: KAF96R5I
KPAF126R5I

SPLIT SYSTEM AIR CONDITIONER

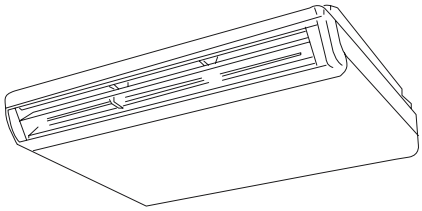
Model No.	Product Code No.
KAF96R5I	387105968
KPAF126R5I	387105969



KAF96R5I



KPAF126R5I



0.8180.492.0 03/2006

IMPORTANT!
Please read before installation

This air conditioning system meets strict safety and operating standards.
For the installer or service person, it is important to install or service the system so that it operates safely and efficiently.

For safe installation and trouble-free operation, you must:
- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state and national electrical codes.
- Pay close attention to all warning and caution notices given in this manual.

•The unit must be supplied with a dedicated electrical line.

WARNING

This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.

CAUTION

This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

If necessary, get help
These instructions are all you need for most installation sites and maintenance conditions.
If you require help for a special problem, contact our sale/service outlet or your certified dealer for additional instructions.

In case of improper installation
The manufacturer shall in no way be responsible for improper installation or maintenance service, including failure to follow the instructions in this document.

SPECIAL PRECAUTIONS

- During installation, connect before the refrigerant system and then the wiring one; proceed in the reverse orden when removing the units.

WARNING **When wiring**

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY QUALIFIED, EXPERIENCED ELECTRICIANS SHOULD ATTEMPT TO WIRE THIS SYSTEM.

- Do not supply power to the unit until all wiring and tubing are completed or reconnected and checked, to ensure the grounding.
- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring.
  Improper connections and inadequate grounding can cause **accidental injury and death**.
- **Ground the unit** following local electrical codes.
- The Yellow/Green wire cannot be used for any connection different from the ground connection.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.
- Do not allow wiring to touch the refrigerant tubing, compressor, or any moving parts of the fan.
- Do not use multi-core cable when wiring the power supply and control lines. Use separate cables for each type of line.

When transporting
Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminium fins on the air conditioner can cut your fingers.

When installing...

… In a ceiling
Make sure the ceiling is strong enough to hold the unit-weight. It may be necessary to build a strong wooden or metal frame to provide added support.

… In a room
Properly insulate any tubing run inside a room to prevent "sweating", which can cause dripping and water damage to walls and floors.

... In moist or uneven locations
Use a raised concrete base to provide a solid level foundation for the outdoor unit. This prevents damage and abnormal vibrations.

... In area with strong winds
Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

... In a snowy area (for heat pump-type systems)
Install the outdoor unit on a raised platform that is higher then drifting snow. Provide snow vents.

When connecting refrigerant tubing

- Keep all tubing runs as short as possible.
- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them; screw by hand and then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

NOTE:
Depending on the system type, liquid and gas lines may be either narrow or wide. Therefore, to avoid confusion, the refrigerant tubing for your particular model is specified as narrow tube for liquid, wide tube for gas.

When servicing
- Turn the power OFF at the main power board before opening the unit to check or repair electrical parts and wiring.
- Keep your fingers and clothing away from any moving parts.
- Clean up the site after the work, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.
- Ventilate the room during the installation or testing the refrigeration system; make sure that, after the installation, no gas leaks are present, because this could produce toxic gas and dangerous if in contact with flames or heat-sources.

Table of Contents

1. SPECIFICATIONS

1-1 Unit Specifications

KAF96R5I

Power source	220 - 240 V ~ 50 Hz

Voltage rating	230 V

Performance			Cooling	Heating
Capacity			See catalogue with the requested matching	
Air circulation	High/Med./Low	m^3/h	400 / 360 / 300	

Features			
Controls/Temperature controls			Microprocessor/ I.C. thermostat
Control unit			Wireless remote control unit
Timer			ON/OFF 24 hours
Fan speed			3 and Auto
Airflow direction		Horizontal	Manual
		Vertical	Manual
Air Filter			Washable, Anti-Mold
Power noise level	High/Med./Low	dB(A)	51 / 48 / 42
Refrigerant tubing connections			Flare type
Refrigerant	Narrow tube	mm(in.)	6.35 (1/4)
tube diameter	Wide tube	mm(in.)	9.52 (3/8)
Refrigerant			R410A
Refrigerant tube kit / Air clean filter			Optional / Optional

Dimensions & Weight			
Unit dimensions	Height	mm	700
	Width	mm	560
	Depth	mm	200
Package dimensions	Height	mm	770
	Width	mm	620
	Depth	mm	265
Weight	Net	kg	18
	Shipping	kg	20
Shipping volume		m^3	0,13

DATA SUBJECT TO CHANGE WITHOUT NOTICE

KPAF126R5I

Power source	220 - 240 V ~ 50 Hz

Voltage rating	230 V

Performance			Cooling	Heating
Capacity			See catalogue with the requested matching	
Air circulation	High	m^3/h	700	

Features			
Controls/Temperature controls			Microprocessor/ I.C. thermostat
Control unit			Wireless remote control unit
Timer			ON/OFF 24 hours
Fan speed			3 and Auto
Airflow direction		Horizontal	Manual
		Vertical	Auto
Air Filter			Washable, Anti-Mold
Power noise level	High	dB(A)	55
Refrigerant tubing connections			Flare type
Refrigerant	Narrow tube	mm(in.)	6.35 (1/4)
tube diameter	Wide tube	mm(in.)	9.52 (3/8)
Refrigerant			R410A
Refrigerant tube kit / Air clean filter			Optional / Optional

Dimensions & Weight			
Unit dimensions	Height	mm	680
	Width	mm	900
	Depth	mm	190
Package dimensions	Height	mm	770
	Width	mm	995
	Depth	mm	280
Weight	Net	kg	23,5
	Shipping	kg	31,5
Shipping volume		m^3	0,21

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1-2 Major Component Specifications

KAF96R5I

Controller PCB				
	Part No.			STORM DCI
	Controls			Microprocessor
	Control circuit fuse			250 V - 3,15 A

Remote Control Unit	RC-7(RC)

Fan & Fan Motor				
	Type			Cross - flow
	Q'ty ……. Dia. and lenght		mm	1…. Ø 100 / L 410
	Fan motor model…Q'ty			K35406-M01892…1
	No. of poles…rpm (230 V, High)			4…1196
	Nominal output		W	27
	Running Amps		A	0.12
	Power input		W	26
	Coil resistance (Ambient temp. 25 °C)		Ω	GRY-WHT: 545÷630 WHT-VLT: 92÷105 VLT-YEL: 62÷71 GRY-BRN: 78÷90
	Safety devices	Type		Thermal protection
		Operating temp. Open	°C	150 ± 10
		Close		Automatic
	Run capacitor		µF	1
			VAC	450

Heat Exch. Coil			
	Coil		Aluminium plate fin / Copper tube
	Rows		1
	Fin pitch	mm	1,4
	Face area	m²	0,185

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KPAF126R5I

Controller PCB			
Part No.			STORM DCI
Controls			Microprocessor
Control circuit fuse			250 V - 3,15 A

Remote Control Unit	RC-7(RC)

Fan & Fan Motor				
Type				Cross - flow
Q'ty ……. Dia. and lenght			mm	2…. Ø 130 / L 180
Fan motor model…Q'ty				K48407-M01596…1
No. of poles…rpm (230 V, High)				4…1160
Nominal output			W	21
Running Amps			A	0,29
Power input			W	65
Coil resistance (Ambient temp. 25 °C)			Ω	GRY-WHT: 298÷343 WHT-PNK: 421÷485 WHT-VLT: 93,5÷108 VLT-ORG: 93,5÷108 ORG-YEL: 211÷243
Safety devices	Type			Thermal protection
	Operating temp.	Open	°C	145 ± 5
		Close		Automatic
Run capacitor			µF	1.5
			VAC	440

Flap Motor		
Type		Synchro motor
Model		M2LJ24ZE31
Rating		AC 208/230 V ; 50-60 Hz
No. of poles…rpm		8…2,5÷3
Nominal output	W	2,5÷3
Coil resistance (Ambient temp. 25 °C)	κΩ	16,45±15%

Heat Exch. Coil		
Coil		Aluminium plate fin / Copper tube
Rows		2
Fin pitch	mm	1,8
Face area		0,192

DATA SUBJECT TO CHANGE WITHOUT NOTICE

1-3 Other Component Specifications

KAF96R5I
KPAF126R5I

Thermistor (Coil sensor TH1)		
Resistance	KΩ	10 ± 3%

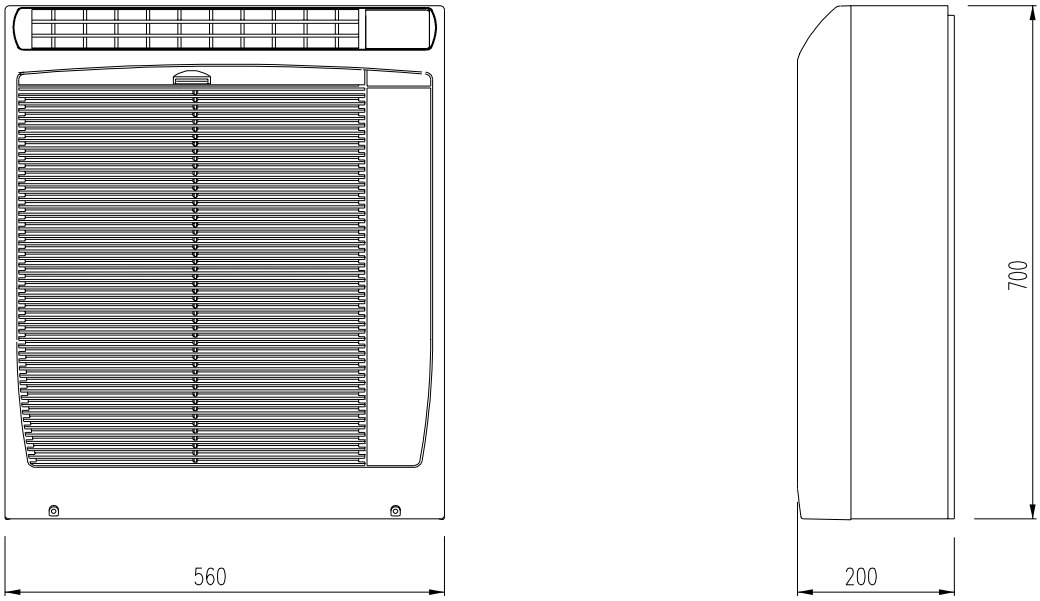
Thermistor (Room sensor TH2)		
Resistance	KΩ	10 ± 5%

Display board assy	
Model	-
Components	COOL led (GREEN)
	HEAT led (RED)
	BUZZER

2. DIMENSIONAL DATA

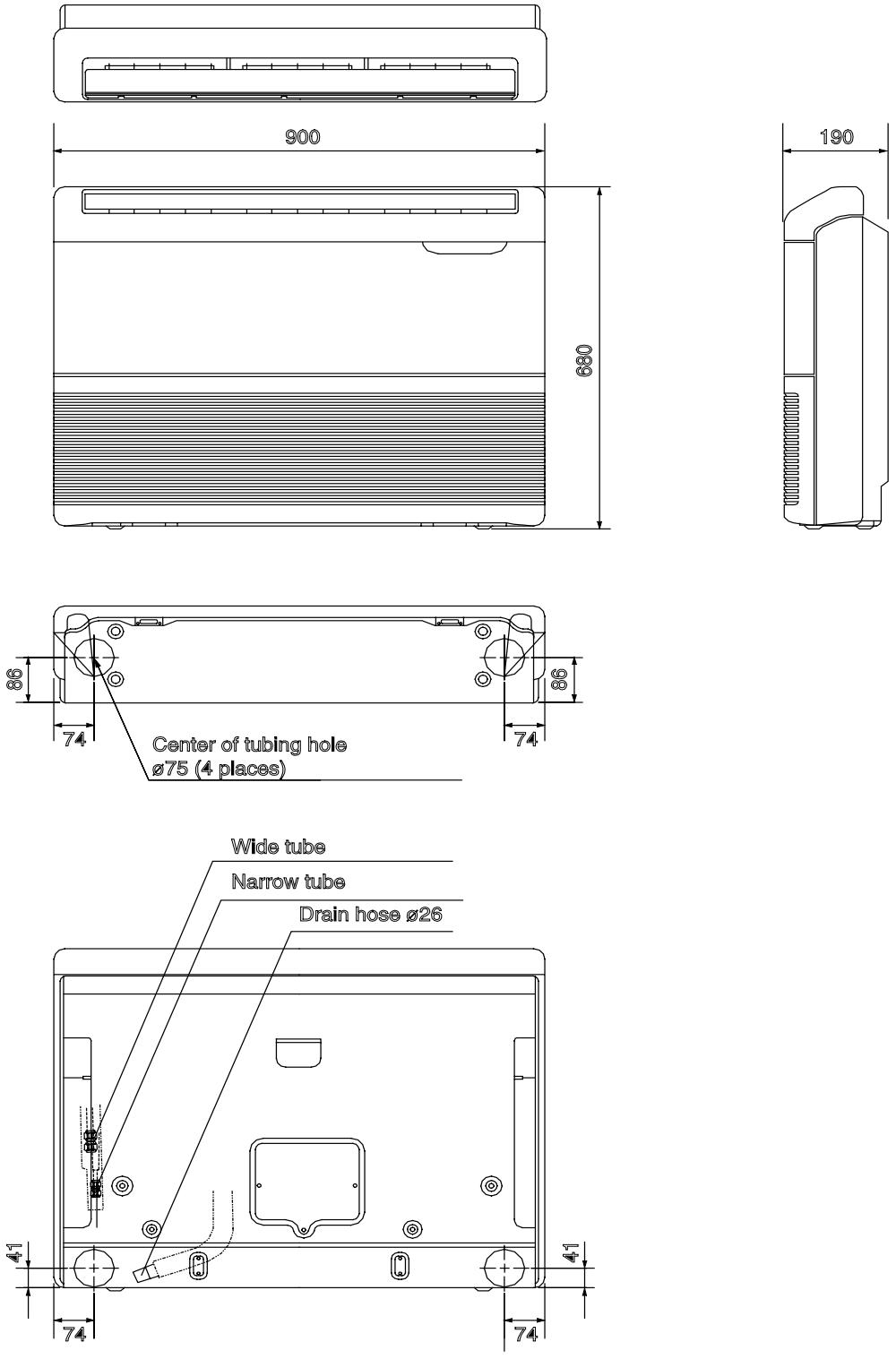
KAF96R5I

Unit: mm



KPAF126R5I

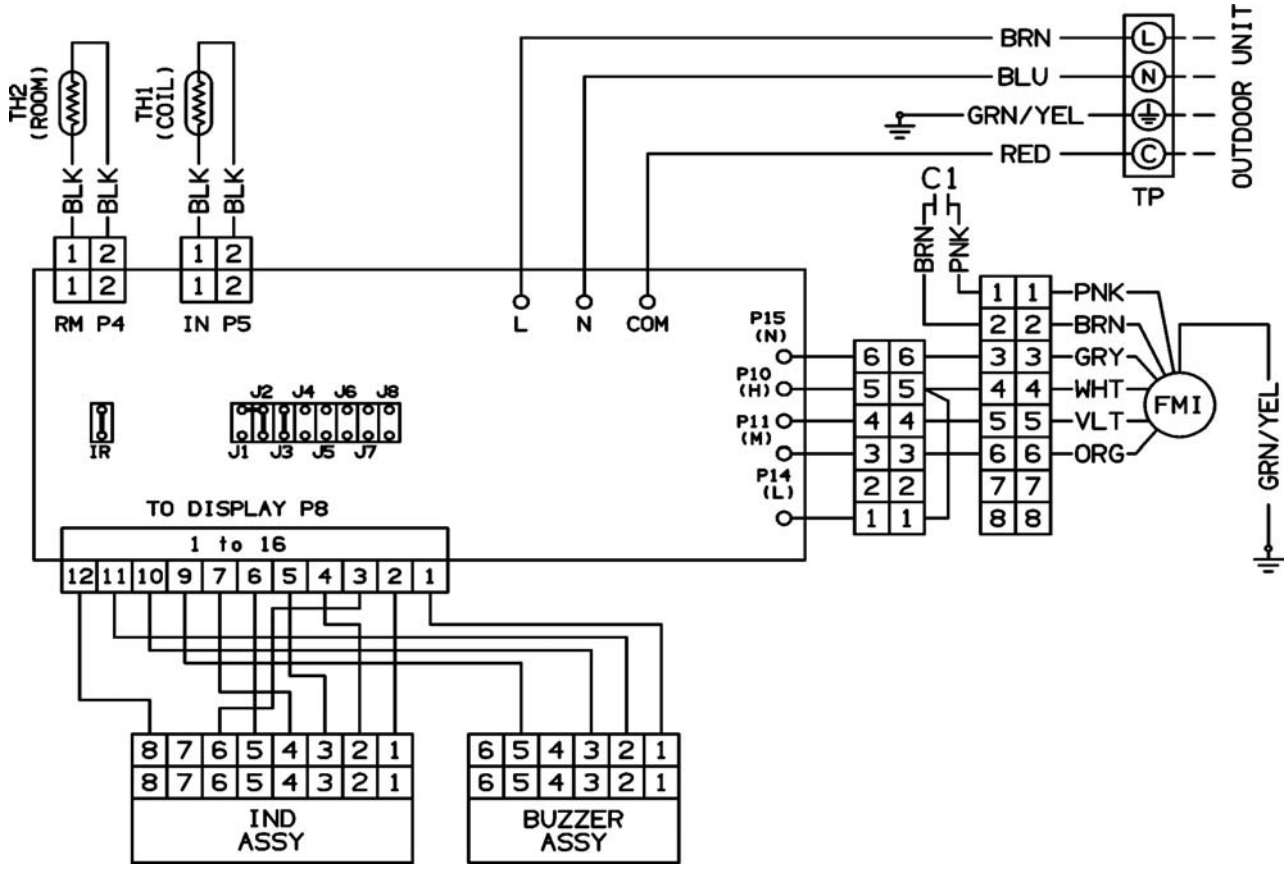
Unit: mm



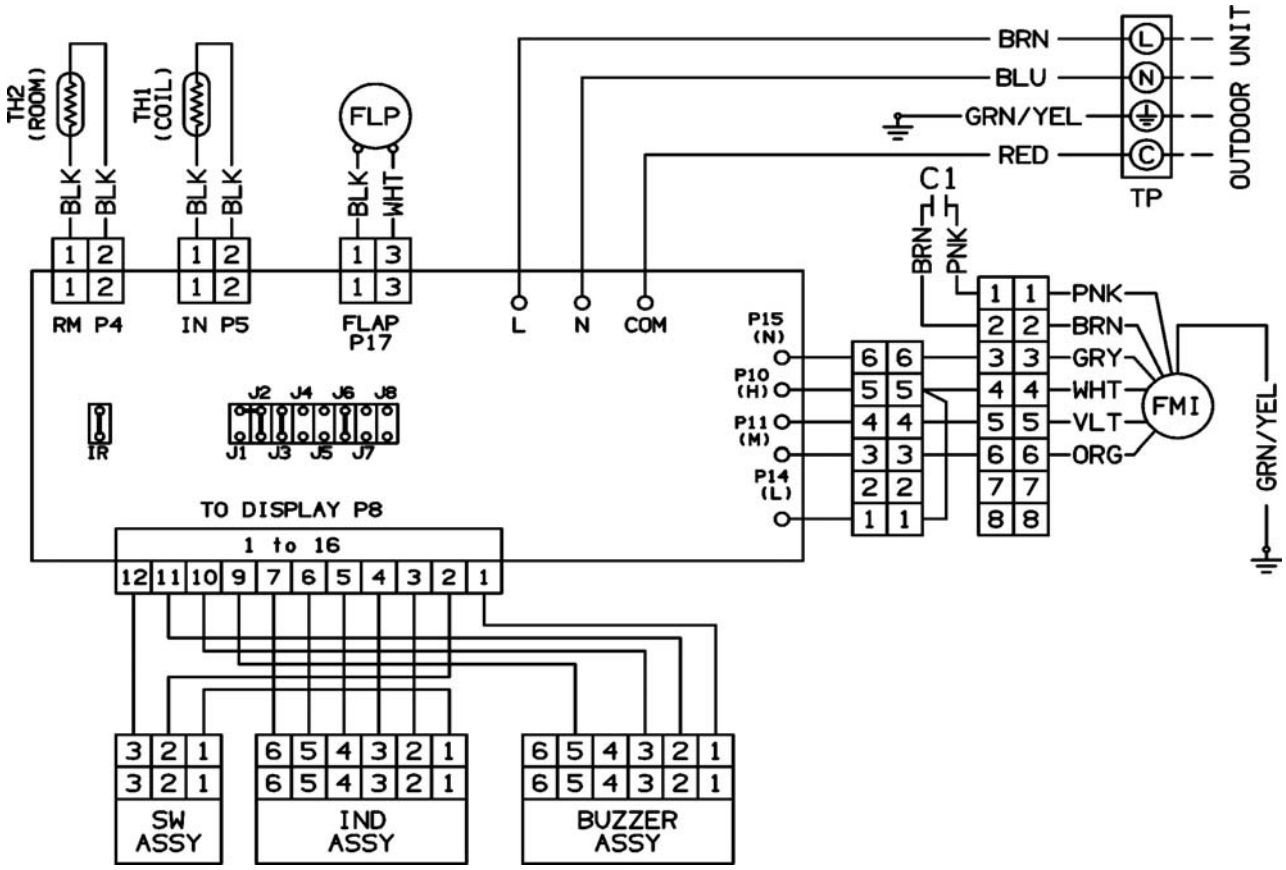
3. ELECTRICAL DATA

3-1 Electric Wiring Diagrams

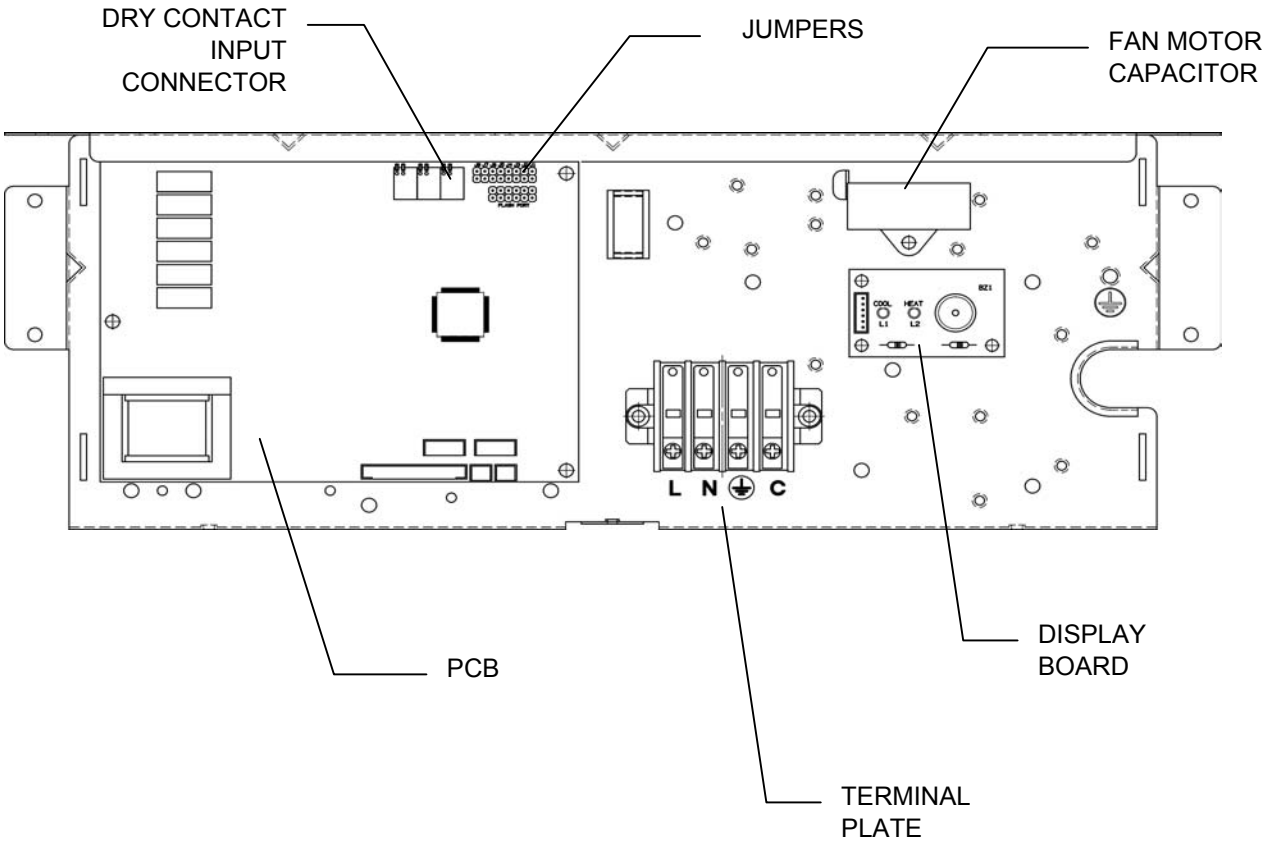
KAF96R5I



KPAF126R5I


TH2 (ROOM)
TH1 (COIL)
FLP
BLK
WHT
BRN
BLU
GRN/YEL
RED
L
N
COM
OUTDOOR UNIT
TP
C1
PNK
RM P4
IN P5
FLAP P17
P15 (N)
P10 (H)
P11 (M)
P14 (L)
FMI
GRY
WHT
VLT
ORG
GRN/YEL
IR
J1 J2 J3 J4 J5 J6 J7 J8
TO DISPLAY P8
1 to 16
SW ASSY
IND ASSY
BUZZER ASSY

4. ELECTRICAL BOX LAY-OUT



NOTE

DISPLAY BOARD operates when checking the system trough the Diagnostic Mode.
See SECTION 6.3 for additional details

JUMPERS settings are according to indoor unit type (cassette, ducted, floor-ceiling) and capacity.
See SECTION 5.9 for details

DRY CONTACT details according to SECTION 5.8

5. FUNCTION

5.1.1 System Operation Concept

The control function is divided between indoor and outdoor unit controllers. Indoor unit is the system 'Master', requesting the outdoor unit for cooling/heating capacity supply. The outdoor unit is the system 'Slave' and it must supply the required capacity unless it enters into a protection mode avoiding it from supplying the requested capacity.
The capacity request is transferred via indoor to outdoor communication, and is represented by a parameter called 'NLOAD'. NLOAD is an integer number with values between 0 and 127, and it represents the heat or cool load felt by the indoor unit.

5.1.2 Compressor Frequency Control

5.1.2.1 NLOAD setting

The NLOAD setting is done by the indoor unit controller, based on a PI control scheme.
The actual NLOAD to be sent to the outdoor unit controller is based on the preliminary LOAD calculation, the indoor fan speed, and the power shedding function.

5.1.3 Target Frequency Setting

The compressor target frequency is a function of the NLOAD number sent from the indoor controller and the outdoor air temperature.
Basic Target Frequency Setting:

NLOAD	Target Frequency
127	*Maximum frequency*
10 < NLOAD < 127	Interpolated value between minimum and maximum frequency
10	*Minimum frequency*
0	Compressor is stopped

Target frequency limits as a function of outdoor air temperature (OAT):

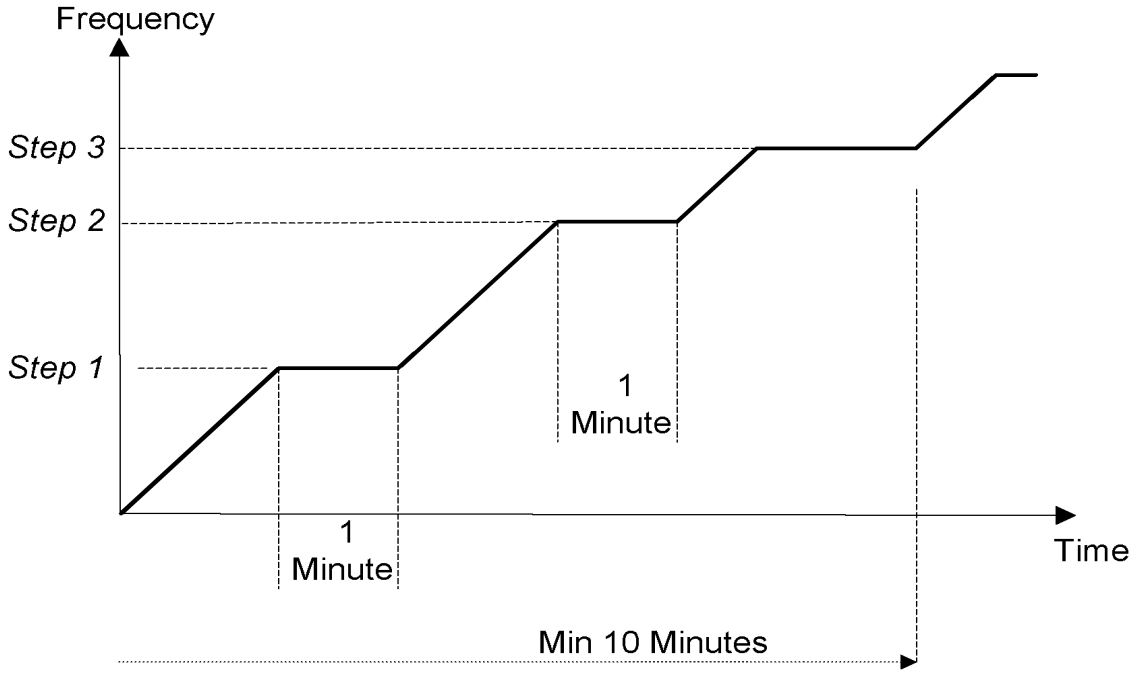
OAT Range	Cool mode limits	Heat mode limits
OAT < 6	*MaxFreqAsOATC*	No limit
6 ≤ OAT < 15		*MaxFreqAsOAT1H*
15 ≤ OAT < 24		*MaxFreqAsOAT2H*
24 ≤ OAT	No limit	

	9000 Units		12000 Units	
	COOLING	HEATING	COOLING	HEATING
Maximum frequency	64Hz	81Hz	80Hz	93Hz
Minimum frequency	30Hz	30Hz	33Hz	35Hz
MaxFreqAsOATC	50Hz	-	50Hz	-
MaxFreqAsOAT1H	-	65Hz	-	75Hz
MaxFreqAsOAT2H	-	60Hz	-	60Hz

5.1.4 Frequency Changes Control

Frequency change rate is 1 Hz/sec.

5.1.5 Compressor Starting Control



5.1.6 Minimum On and Off Time

3 minutes.

5.1.7 Indoor Fan Control

10 Indoor fan speeds are determined for each model. 5 speeds for cool/dry/fan modes and 5 speeds for heat mode.
When user sets the indoor fan speed to a fixed speed (Low/ Medium/ High), unit will operate constantly at set speed.
When Auto Fan is selected, indoor unit controller can operate in all speeds. The actual speed is set according to the cool/heat load.

5.1.7.1 Turbo Speed

The Turbo speed is activated during the first 30 minutes of unit operation when auto fan speed is selected and under the following conditions:
Difference between set point and actual room temperature is bigger then 3 degrees.
Room temperature > 22 for cooling, or < 25 for heating.

	9000 Units		12000 Units	
	COOLING	HEATING	COOLING	HEATING
Step 1	60Hz	60Hz	60Hz	60Hz
Step 2	70Hz	70Hz	70Hz	70Hz
Step 3	90Hz	90Hz	90Hz	90Hz

5.1.8 Outdoor Fan Control

7 outdoor fan speeds are determined for each model. 3 speeds for cool and dry modes, and 3 speeds for heat mode, and a very low speed.
Outdoor fan speed is a function of compressor frequency and outdoor air temperature (OAT).
4 routines for fan control are determined. The control routine selection depends on operation mode, compressor speed, outdoor air temperature (OAT) and heat sink temperature (HST).

Routine	Conditions
A	Heating with OAT < 15^0C or Cooling with OAT > 20^0C, or HST > 50^0C or Faulty OAT
B	Cooling with 20^0C > OAT > 7^0C
C	Cooling with 7^0C > OAT
D	Heating with OAT > 15^0C

	Outdoor Fan Speed			
Compressor Frequency (CF)	Routine A	Routine B	Routine C	Routine D
CF = 0	OFF	OFF	OFF	OFF
10 ≤ CF < *45*	Low	Low	Very Low	Low
45 ≤ CF < *57*	Medium	Low	Very Low	Low
57 ≤ CF	High	Low	Low	Medium

When compressor is switched to OFF and the heat sink temperature is above 55 degrees, the outdoor fan will remain ON in low speed for up to 3 minutes.

5.1.9 Base Heater Control

When OAT is connected, Base Heater will be on when unit is in heating and OAT<2^0C.
When OAT is disconnected, Base Heater will be on when unit is in heating.

5.2 Fan Mode

In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.
In AutoFan user setting, fan speed will be adjusted automatically according to the difference between actual room temperature and user set point temperature.

5.3 Cool Mode

NLOAD is calculated according to the difference between actual room temperature and user set point temperature by PI control.
In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.
In AutoFan user setting, fan speed will be adjusted automatically according to the calculated NLOAD.

5.4 Heat Mode

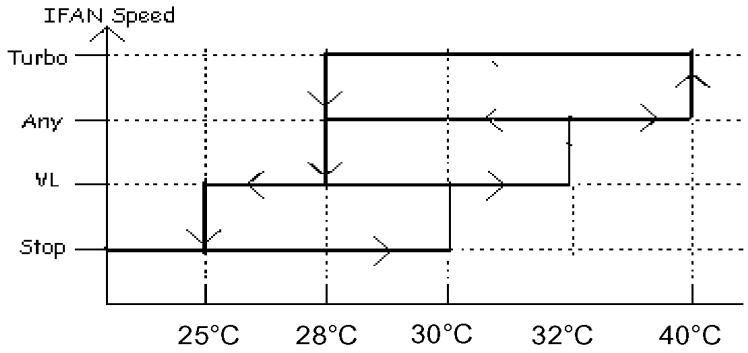
NLOAD is calculated according to the difference between actual room temperature and user set point temperature by PI control.
In high/ medium/ low indoor fan user setting, unit will operate fan in selected speed.
In AutoFan user setting, fan speed will be adjusted automatically according to the calculated NLOAD.

5.4.1 Temperature compensation

In wall mounted models, 2 degrees are reduced from room temperature reading (except when in I-Feel mode), to compensate for temperature difference between high and low areas in the heated room.

5.4.2 Indoor Fan Control in Heat Mode

Indoor fan speed depends on the indoor coil temperature:



5.5 Auto Cool/Heat Mode

When in auto cool heat mode unit will automatically select between cool and heat mode according to the difference between actual room temperature and user set point temperature (ΔT).
Unit will switch from cool to heat when compressor is off for 3 minutes, and ΔT < -3.
Unit will switch from heat to cool when compressor is off for 5 minutes, and ΔT < -3.

5.6 Dry Mode

As long as room temperature is higher then the set point, indoor fan will work in low speed and compressor will work between 0 and *40* Hz.
When the room temperature is lower than the set point, compressor will be switched OFF and indoor fan will cycle 3 minutes OFF, 1 minute ON.

5.7 Protections

There are 5 protection codes.
Normal (Norm) – unit operate normally.
Stop Rise (SR) – compressor frequency can not be raised but does not have to be decreased.
HzDown1 (D1) – Compressor frequency is reduced by 2 to 5 Hz per minute.
HzDown2 (D2) – Compressor frequency is reduced by 5 to 10 Hz per minute.
Stop Compressor (SC) – Compressor is stopped.

5.7.1 Indoor Coil Defrost Protection

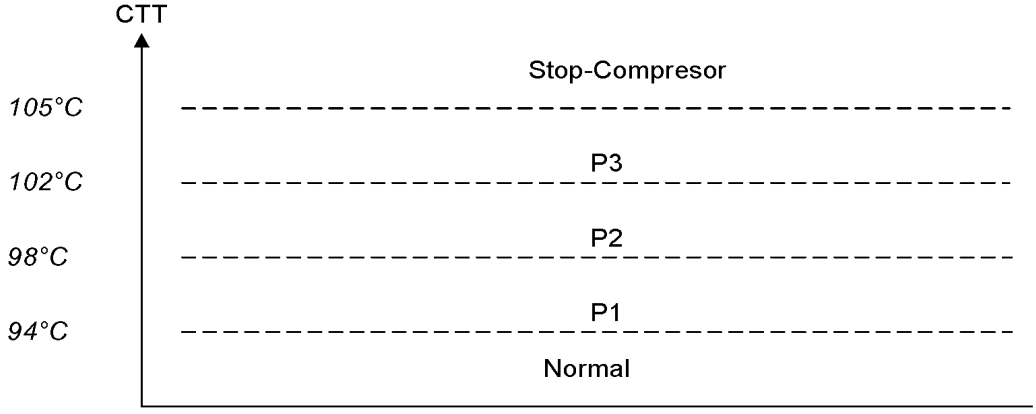
ICT	ICT Trend				
	Fast Increasing	Increasing	No change	Decreasing	Fast Decreasing
ICT < -2	SC	SC	SC	SC	SC
-2 ≤ ICT < 0	D1	D1	D2	D2	D2
0 ≤ ICT < 2	SR	SR	D1	D2	D2
2 ≤ ICT < 4	SR	SR	SR	D1	D2
4 ≤ ICT < 6	Norm	Norm	SR	SR	D1
6 ≤ ICT < 8	Norm	Norm	Norm	SR	SR
8 ≤ ICT	Normal				

5.7.2 Indoor Coil over Heating Protection

ICT	ICT Trend				
	Fast Decreasing	Decreasing	No Change	Increasing	Fast Increasing
ICT > 55	SC	SC	SC	SC	SC
53 < ICT ≤ 55	D1	D1	D2	D2	D2
49 < ICT ≤ 53	SR	SR	D1	D2	D2
47 < ICT ≤ 49	SR	SR	SR	D1	D2
45 < ICT ≤ 47	Norm	Norm	SR	SR	D1
43 < ICT ≤ 45	Norm	Norm	Norm	SR	SR
ICT ≤ 43	Normal				

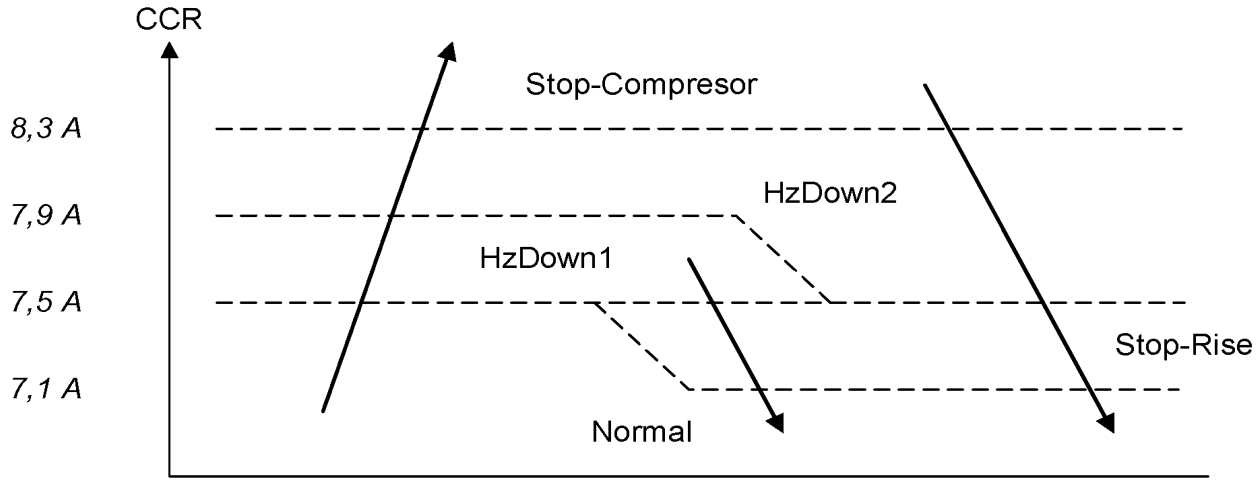
5.7.3 Compressor over Heating Protection

Compressor temperature can be in one of 5 control zones (4 in protection, and 1 normal), according to the following chart.



Control Status	Compressor Temperature Increases	Else
P1	Norm	SR
P2	D1	SR
P3	D2	D1
Stop Compressor	SC	

5.7.4 Compressor over Current Protection



5.7.5 Outdoor Coil Deicing Protection

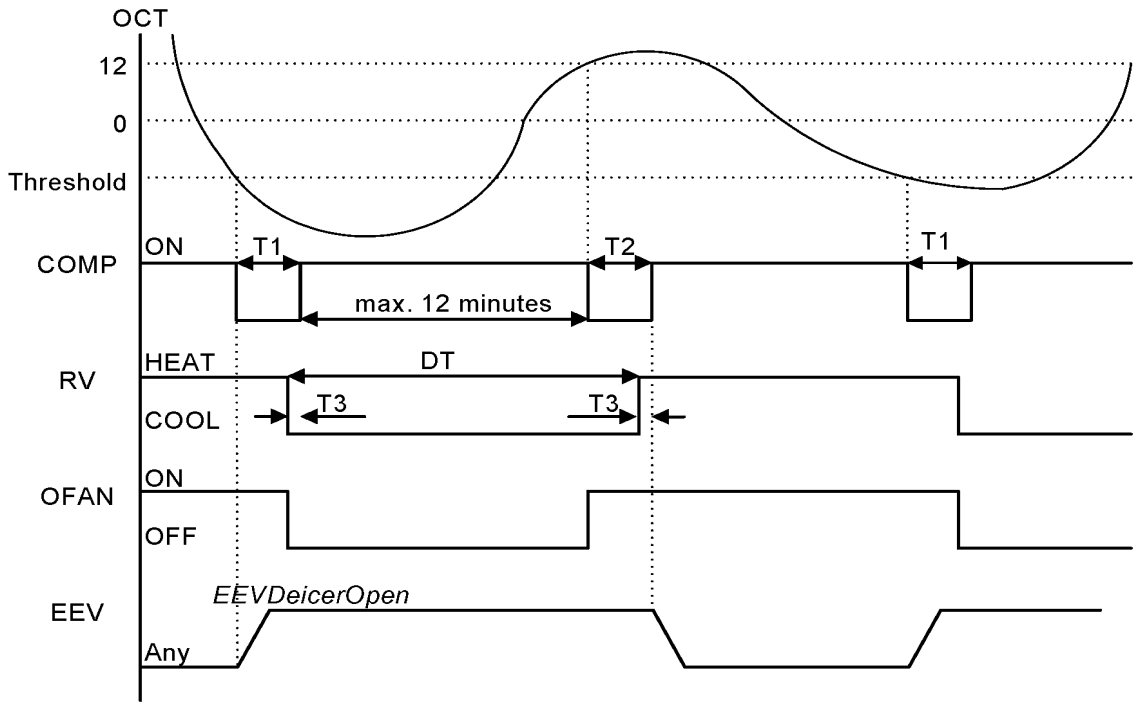
5.7.5.1 Deicing Starting Conditions

Deicing operation will start when either one of the following conditions exist:
Case 1: OCT < OAT – 8 AND TLD > DI
Case 2: OCT < OAT – 12 AND TLD > 30 minutes.
Case 3: OCT is Invalid AND TLD > DI
Case 4: Unit is just switched to STBY AND OCT < OAT – 8
Case 5: NLOAD = 0 AND OCT < OAT -8

OCT – Outdoor Coil Temperature
OAT – Outdoor Air Temperature
TLD – Time from Last Deicing
DI – Deicing Interval (Time Interval Between Two Deicing)

Deicing interval time when compressor is first started in heat mode, is 10 minutes if OCT < -2, and is 40 minutes in other cases.
Deicing interval time is changed (increased/ decreased in 10 minutes steps) as a function of deicing time. If deicing time is shorter then former deicing time, the deicing interval time will be increased. If deicing time is longer then former deicing time, the deicing interval time will be decreased.

5.7.5.2 Deicing Protection Procedure



T1=T2=36 seconds, T3 = 6 seconds

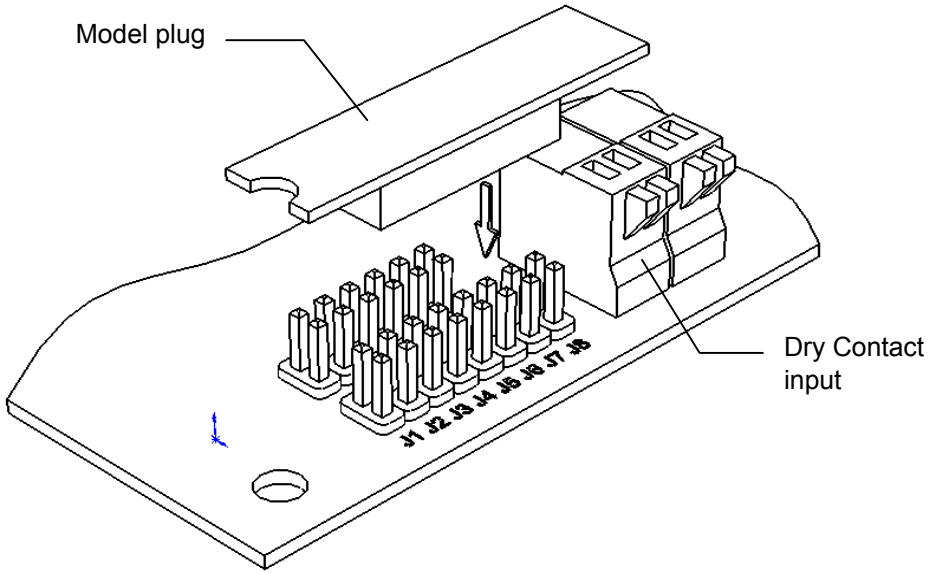
5.8 Indoor Unit Dry Contact

Indoor unit Dry contact has two alternative functions that are selected by J8.

	Function	Contact = Open	Contact = Closed
J8 = Open	Presence Detector Connection	No Limit	Forced to STBY
J8 = Closed	Power Shedding Function	No Limit	Limit NLOAD

See Jumper Setting section 5.9 for the location of Dry Contact and J8

5.9 Jumper Settings



Indoor units JUMPERS are set according to the following table

Indoor unit	J1	J2 (*)	J3	J4	J5	J6	J7	J8
KAF96R5I	O	**C**	**C**	O	O	O	O	O
KPAF126R5I	O	**C**	**C**	O	O	**C**	O	O

O= OPENED jumper
C= CLOSED jumper
J2= Temperature compensation jumper.

5.10 Test Mode

5.10.1 Entering Test Mode

System can enter Test mode in two ways:
Automatically when the following conditions exists for 30 minutes continuously:
Mode = Cool, Set point = 16, Room temperature = 27±1, Outdoor temperature = 35±1
Or
Mode = Heat, Set point = 30, Room temperature = 20±1, Outdoor temperature = 7±1
Manually when entering diagnostics with the following settings:
Mode = Cool, Set point = 16
Mode = Heat, Set point = 30

5.10.2 Unit Operation in Test Mode

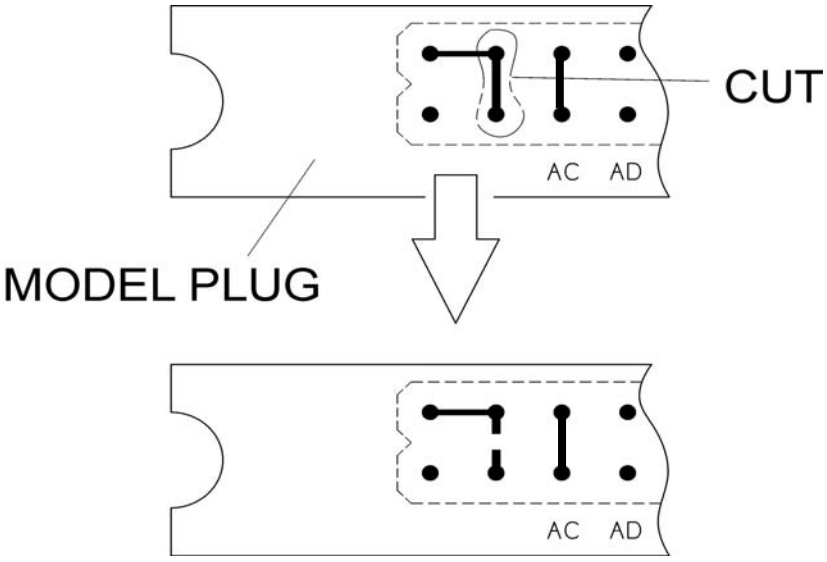
In test mode, the unit will operate in fixed settings according to the indoor fan speed setting:

Indoor Fan Speed Setting	Unit Setting
Low	Minimum Capacity Setting
High	Nominal Capacity Setting
Auto	Maximum Capacity Setting

During test mode, protections are disabled, except for stop compressor status.

5-11 Temperature Compensation (room air)

Units are factory set with Temperature Compensation DISABLED (jumper J2 CLOSED).
In case of indoor units installed on the ceiling, it is possible to ENABLE this feature cutting the circuit track on the model plug as shown



6. TROUBLESHOOTING

Warning!!!

When Power Up – the whole outdoor unit controller, including the wiring, is under HIGH VOLTAGE!!!

Never open the Outdoor unit before turning off the Power!!!

When turned off, the system is still charged (400V)!!!

It takes about 4 Min. to discharge the system.

Touching the controller before discharging may cause an electrical shock!!!

For safe handling of the controller please refer to section 6.5 below.

6.1 Single Split system failures and corrective actions

No	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
1	Power supply indicator (Red LED) does not light up.	No power supply	Check power supply. If power supply is OK, check display and display wiring. if OK, replace controller.
2	Unit does not respond to remote control message	Remote control message not reached the indoor unit	Check remote control batteries, if batteries are OK, check display and display wiring, if OK, replace display PCB. If still not OK replace controller.
3	Unit responds to remote control message but Operate indicator (Green LED) does not light up	Problem with display PCB	Replace display PCB. If still not OK replace controller.
4	Indoor fan does not start (louvers are opened and Green LED does light up)	Unit in heat mode and coil is still not warm.	Change to cool mode and check.
		Problem with PCB or capacitor	Change to high speed and Check power supply to motor is higher than 130VAC (for triack controlled motor) or higher than 220VAC for fixed speed motors, if OK replace capacitor, if not OK replace controller
5	Indoor fan works when unit is OFF, and indoor fan speed is not changed by remote control command.	PCB problem	Replace controller
6	Compressor does not start	Electronics control problem or protection	Perform diagnostics (See 6.3 below), and follow the actions described.
7	Compressor stops during operation and Green LED remains on	Electronic control or power supply problem	Perform diagnostics (See 6.3 below), and follow the actions described.

No	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
8	Compressor is on but outdoor fan does not work	Problem with outdoor electronics or outdoor fan	Check outdoor fan motor according to the procedure in section 6.4.3 below, if not OK replace controller
9	Unit works in wrong mode (cool instead of heat or heat instead of cool)	Electronics or power connection to RV	Check RV power connections, if OK, Check RV operation with direct 230VAC power supply, if OK, Replace outdoor controller.
10	All components are operating properly but no cooling or no heating	Refrigerant leak	Check refrigeration system.
11	Compressor is over heated and unit does not generate capacity	EEV problem	Check EEV
12	Units goes into protections and compressor is stopped with no clear reason	Control problem or refrigeration system problem	Perform diagnostics (See 6.3 below), and follow the actions described.
13	Compressor motor is generating noise and no suction occurs	Phase order to compressor is wrong	Check compressor phase order.
14	Water leakage from indoor unit	Indoor unit drainage tube is blocked	Check and open drainage tube.
15	Freezing of outdoor unit in heat mode and outdoor unit base is blocked with ice		Connect base heater.
16	Unit operates with wrong fan speeds or wrong frequency	Wrong jumper settings	Perform diagnostics (See 6.3 below), and check if units is operating by EEPROM parameters.

6.2 Checking the refrigeration system

Checking system pressures and other thermodynamic measures should be done when system is in Test Mode (in Test mode, system operates in fixed settings). The performance curves given in this manual are given for unit performance in test mode when high indoor fan speed is selected.

Entering test mode:

Set unit to Cool/16 degrees/High indoor fan speed, or Heat/30 degrees/High indoor fan speed, and enter diagnostics.

6.3 Judgment by Indoor/Outdoor Unit Diagnostics

Enter diagnostics mode - press for five seconds Mode button in any operation mode. Acknowledgment is by 3 short beeps and lights of COOL and HEAT LED's. Then, every short pressing of Mode button will scroll between Indoor and Outdoor unit diagnostic modes by the acknowledgment of 3 short beeps and lighting of COOL and HEAT LED's.
During the Outdoor unit diagnostics all four Indoor LED's (STBY, Operate, Filter and Timer) are blinking. When Indoor diagnostics is displayed, all four LED's (STBY, Operate, Filter and Timer) are ON.
When system enters diagnostics mode, only one fault code is shown. Order of priority is from the lower to the higher number. Diagnostics is continuously ON as long as power is ON. The current system operation mode will not be changed.
If no fault occurred in the system, no fault code will be displayed during normal operation mode. The last fault code will be displayed even if the system has recovered from that fault. The last fault will be deleted from the EEPROM after the system has exit diagnostics mode.
In diagnostics mode, system fault / status will be indicated by blinking of Heat & Cool LEDs. The coding method will be as follows:
Heat LED will blink 5 times in 5 seconds, and then will be shut off for the next 5 seconds. Cool LED will blink during the same 5 seconds according to the following Indoor / Outdoor unit tables:
Note: 0 – OFF, 1-ON

RT1= INDOOR COIL sensor

RT2= ROOM sensor

6.3.1 Indoor unit Diagnostics

No	Problem	5	4	3	2	1
1	RT-1 is disconnected	0	0	0	0	1
2	RT-1 is shorted	0	0	0	1	0
3	RT-2 is disconnected	0	0	0	1	1
4	RT-2 is shorted	0	0	1	0	0
5	Reserved	0	0	1	0	1
7	Communication mismatch	0	0	1	1	1
8	No Communication	0	1	0	0	0
9	No Encoder	0	1	0	0	1
10	Reserved	0	1	0	1	0
11	Outdoor Unit Fault	0	1	0	1	1
…	Reserved					
17	Defrost protection	1	0	0	0	1
18	Deicing Protection	1	0	0	1	0
19	Outdoor Unit Protection	1	0	0	1	1
20	Indoor Coil HP Protection	1	0	1	0	0
21	Overflow Protection	1	0	1	0	1
22	Reserved					
24	EEPROM Not Updated	1	1	0	0	0
25	Bad EEPROM	1	1	0	0	1
26	Bad Communication	1	1	0	1	0
27	Using EEPROM data	1	1	0	1	1
28	Model A	1	1	1	0	0
29	Model B	1	1	1	0	1
30	Model C	1	1	1	1	0
31	Model D	1	1	1	1	1

6.3.2 Indoor unit diagnosis and corrective actions

No.	Fault	Probable Cause	Corrective Action
1	Sensor failures of all types		Check sensor connections or replace sensor
2	Communication mismatch	Indoor and Outdoor controllers are with different versions	Replace Indoor controller
3	No Communication	Communication or grounding wiring is not good.	Check Indoor to Outdoor wiring and grounding
4	No Encoder	Indoor electronics or motor	Check motor wiring, if ok, replace motor, if still not ok, replace Indoor controller.
5	Outdoor Unit Fault	Outdoor controller problem	Switch to Outdoor diagnostics.
6	EEPROM Not Updated	System is using ROM parameters and not EEPROM parameters	No action, unless special parameters are required for unit operation.
7	Bad EEPROM		No action, unless special parameters are required for unit operation.
8	Bad Communication	Communication quality is low reliability	Check Indoor to Outdoor wiring and grounding
9	Using EEPROM data	No problem. System is using EEPRRRROM parameters	

6.3.3 Outdoor unit Diagnostics

No	Problem	5	4	3	2	1
1	OCT is disconnected	0	0	0	0	1
2	OCT is shorted	0	0	0	1	0
3	CTT is disconnected	0	0	0	1	1
4	CTT is shorted	0	0	1	0	0
5	HST is disconnected (when enabled)	0	0	1	0	1
6	HST is shorted (when enabled)	0	0	1	1	0
7	OAT is disconnected (when enabled)	0	0	1	1	1
8	OAT is shorted (when enabled)	0	1	0	0	0
9	TSUC is disconnected (when enabled)	0	1	0	0	1
10	TSUC is shorted (when enabled)	0	1	0	1	0
11	IPM Fault	0	1	0	1	1
12	Bad EEPROM	0	1	1	0	0
13	DC under voltage	0	1	1	0	1
14	DC over voltage	0	1	1	1	0
15	AC under voltage	0	1	1	1	1
16	Indoor / Outdoor unit Communication mismatch	1	0	0	0	0
17	No Communication	1	0	0	0	1
18	Reserved	1	0	0	1	0
20	Heat sink Over Heating	1	0	1	0	0
21	Deicing	1	0	1	0	1
22	Compressor Over Heating	1	0	1	1	0
23	Compressor Over Current	1	0	1	1	1
…	Reserved					
27	Bad Communication	1	1	0	1	1

6.3.4 Outdoor unit diagnosis and corrective actions

).	Fault	Probable Cause	Corrective Action
	Sensors failures of all types		Check sensors connections or replace sensors.
	IPM Fault	Electronics HW problem	Check all wiring and jumper settings, if OK, replace electronics.
	Bad EEPROM		No action, unless special parameters are required for unit operation.
	DC under/over Voltage	Electronics HW problem	Check outdoor unit power supply voltage
	AC under Voltage		Check outdoor unit power supply voltage
	Indoor / Outdoor unit Communication mismatch	Indoor and Outdoor controllers are with different versions	Replace Indoor controller
	No Communication	Communication or grounding wiring is not good.	Check Indoor to Outdoor wiring and grounding
	Compressor Lock		Switch unit to STBY and restart
	Bad Communication	Communication quality is low reliability	Check Indoor to Outdoor wiring and grounding

6.4 Simple procedures for checking the Main Parts

6.4.1 Checking Mains Voltage.

Confirm that the Mains voltage is between 198 and 264 VAC. If Mains voltage is out of this range, abnormal operation of the system is expected. If in range check the Power (Circuit) Breaker and look for broken or loosed cable lugs or wiring mistake(s).

6.4.2 Checking Power Input.

If Indoor unit power LED is unlighted, power down the system and check the fuse of the Indoor unit. If the fuse is OK replace the Indoor unit controller. If the fuse has blown, replace the fuse and power up again.
Checking Power Input procedure for the Outdoor unit is the same as with the Indoor unit.

6.4.3 Checking the Outdoor Fan Motor.

Enter Test Mode (where the OFAN speed is high)
Check the voltage between lead wires according to the normal value as following:

- Between red wire and black wire: 310VDC +/- 20V
- Between orange wire and black wire: 15VDC +/- 1V
- Between yellow wire and black wire: 2-6VDC

6.4.4 Checking the Compressor.

The compressor is brushless permanence magnetic DC motor. Three coil resistance is same. Check the resistance between three poles. The normal value should be below 0.5 ohm (TBD).

6.4.5 Checking the Reverse Valve (RV).

Running in heating mode, check the voltage between two pins of reverse valve connector, normal voltage is 220VAC.

6.4.6 Checking the electrical expansion valve (EEV).

The EEV has two parts, drive part and valve. The drive part is a step motor; it is ringed on the valve. Check the drive voltage (12VDC). When Outdoor unit is power on, EEV shall run and have click and vibration.

6.5 Precaution, Advise and Notice Items

6.5.1 High voltage in Outdoor unit controller.

Whole controller, including the wires that are connected to the Outdoor unit controller may have the potential hazard voltage when power is on. Touching the Outdoor unit controller may cause an electrical shock.
Advise: Don't touch the naked lead wire and don't insert finger, conductor or anything else into the controller when power is on.

6.5.2 Charged Capacitors

Three large-capacity electrolytic capacitors are used in the Outdoor unit controller. Therefore, charging voltage (380VDC) remains after power down. Discharging takes about four minutes after power is off. Touching the Outdoor unit controller before discharging may cause an electrical shock.

6.5.3 Additional advises

- When disassemble the controller or the front panel, turn off the power supply.
- When connecting or disconnecting the connectors on the PCB, hold the whole housing, don't pull the wire.
- There are sharp fringes and sting on shell. Use gloves when disassemble the A/C units.

7. CHECKING ELECTRICAL COMPONENTS

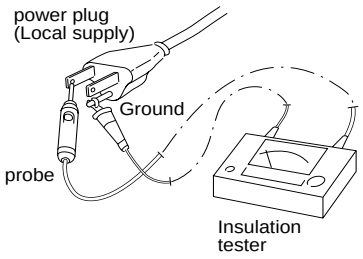
7-1. Measurement of Insulation Resistance

- The insulation is in good condition if the resistance exceeds 2MΩ.

7-1-1. Power Supply Wires

Clamp the grounding terminal of the power plug with a lead clip of the insulation resistance tester and measure the resistance by placing a probe on either of the two power terminals. (Fig. 1)

Then, also measure the resistance between the grounding and other power terminals. (Fig. 1)



NOTE

The shape of the power plug may differ from that of the air conditioner which you are servicing.

Fig. 1

7-1-2. Indoor Unit

Clamp a metallic part of the unit with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on each terminal screw where power supply lines are connected on the terminal plate. (Fig. 2)

7-1-3. Outdoor Unit

Clamp an aluminum plate fin or copper tube with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on each terminal screw on the terminal plate. (Fig. 2)
Note that the ground line terminal should be skipped for the check.

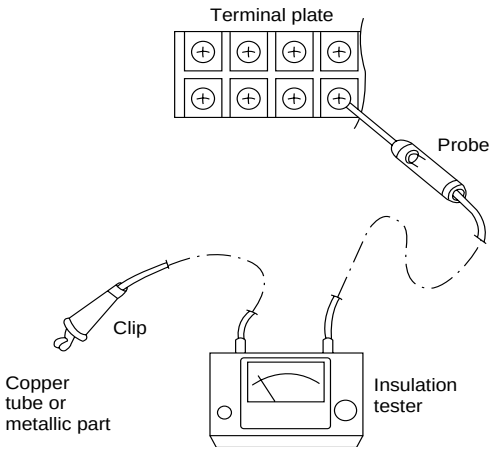


Fig. 2

7-1-4. Measurement of Insulation Resistance for Electrical Parts

Disconnect the lead wires of the desired electric part from terminal plate, capacitor, etc. Similarly disconnect the connector. Then measure the insulation resistance. (Figs. 3 and 4)

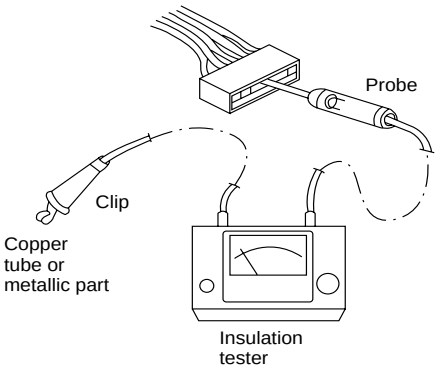


Fig. 3

NOTE

Refer to Electric Wiring Diagram.

If the probe cannot enter the poles because the hole is too narrow then use a probe with a thinner pin.

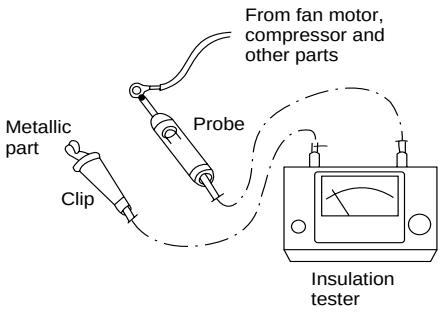


Fig. 4

7-2. Checking Continuity of Fuse on PCB Ass'y

- Remove the PCB Ass'y from the electrical component box. Then pull out the fuse from the PCB Ass'y. (Fig. 5)
- Check for continuity using a multimeter as shown in Fig. 6.

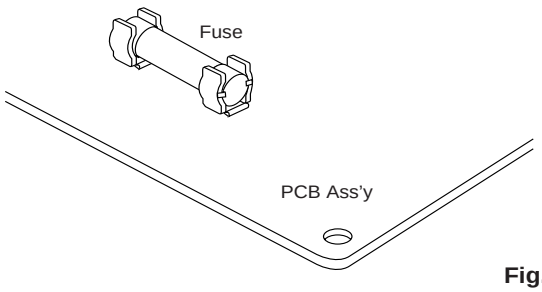


Fig. 5

7-3. Checking Motor Capacitor

Remove the lead wires from the capacitor terminals, and then place a probe on the capacitor terminals as shown in Fig. 7. Observe the deflection of the pointer, setting the resistance measuring range of the multimeter to the maximum value.

The capacitor is "good" if the pointer bounces to a great extent and then gradually returns to its original position.

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

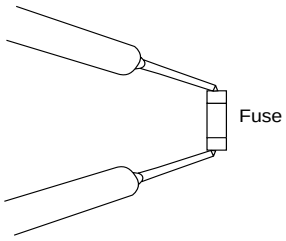


Fig. 6

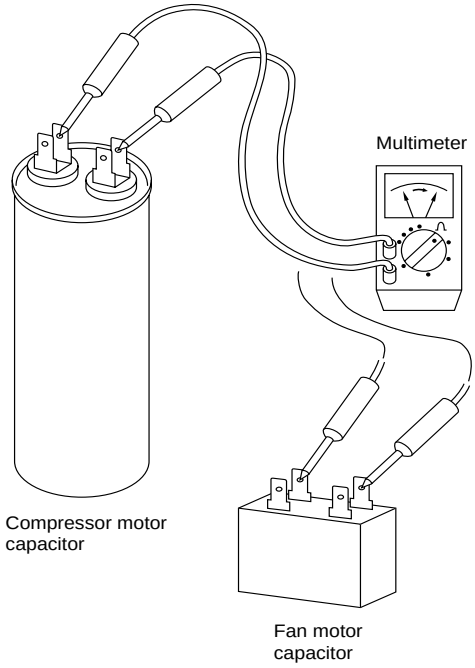


Fig. 7

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