

HEAT PUMP MODELS

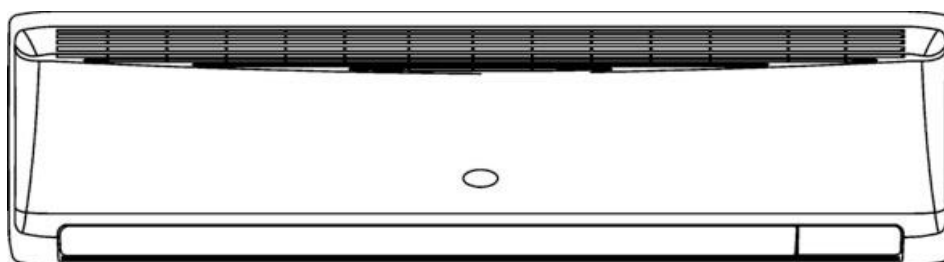
INDOOR UNIT: **MPAF188R5TAA**
MPAF228R5TAA

COOLING MODELS

MPAF188C5TAA
MPAF228C5TAA

SPLIT SYSTEM AIR CONDITIONER

Model No.	Product Code No.
MPAF188R5TAA	38.7104.033
MPAF228R5TAA	38.7104.034
MPAF188C5TAA	38.7104.037
MPAF228C5TAA	38.7104.038





RoHS

This product does not contain any hazardous substances prohibited by the RoHS Directive.



WARNING

You are requested to use RoHS compliant parts for maintenance or repair.
You are requested to use lead-free solder.

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 order when removing the units.

WARNING

When wiring



ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY A 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 or wall

Make sure the ceiling/wall 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 than 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.

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1. SPECIFICATIONS

1-1 Unit Specifications

MPAF188R5TAA

MPAF188C5TAA

Power source		220 - 240 V ~ 50 Hz	
Voltage rating		230 V - 50 Hz	
Performance		Cooling	Heating
Capacity		See catalogue with the requested matching	
Air circulation	High/Med./Low	m ³ /h	
		880 / 710 / 580	

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	59
Refrigerant tubing connections		Flare type	
Refrigerant tube diameter	Narrow tube	mm(in.)	6.35 (1/4)
	Wide tube	mm(in.)	12.7 (1/2)
Refrigerant		R410A	
Refrigerant tube kit / Air clean filter		Optional / Optional	

Dimensions & Weight			
Unit dimensions	Height	mm	285
	Width	mm	995
	Depth	mm	240
Package dimensions	Height	mm	360
	Width	mm	1070
	Depth	mm	290
Weight	Net	kg	12
	Shipping	kg	15
Shipping volume		m ³	0,11

DATA SUBJECT TO CHANGE WITHOUT NOTICE

MPAF228R5TAA

MPAF228C5TAA

Power source	220 - 240 V ~ 50 Hz	
Voltage rating	230 V - 50 Hz	
Performance	Cooling	Heating
Capacity	See catalogue with the requested matching	
Air circulation High/Med./Low	m ³ /h 880 / 710 / 580	

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 Vertical	Manual Auto
Air Filter	Washable, Anti-Mold	
Power noise level	High	dB-A 59
Refrigerant tubing connections	Flare type	
Refrigerant tube diameter	Narrow tube	mm(in.) 6.35 (1/4)
	Wide tube	mm(in.) 15.88 (5/8)
Refrigerant	R410A	
Refrigerant tube kit / Air clean filter	Optional / Optional	

Dimensions & Weight			
Unit dimensions	Height	mm	285
	Width	mm	995
	Depth	mm	240
Package dimensions	Height	mm	360
	Width	mm	1070
	Depth	mm	290
Weight	Net	kg	12
	Shipping	kg	15
Shipping volume		m ³	0,11

DATA SUBJECT TO CHANGE WITHOUT NOTICE

1-2 Major Component Specifications

MPAF188R5TAA

MPAF188C5TAA

Controller PCB	
Part No.	SAC ON-OFF IDU
Controls	Microprocessor
Control circuit fuse	250 V - 3,15 A
Jumper setting JP1..JP5	2,54mm-5pcs

Remote Control Unit	SAC W-REM
---------------------	-----------

Fan & Fan Motor		
Type	Cross - flow	
Q'ty Dia. and lenght mm	1.... Ø 88 / L 746	
Fan motor model...Q'ty	UF2Q-21SB5P... 1	
No. Of poles...rpm (230 V, Hi/Me/Lo)	2... 1550/1250/1025	
Nominal output W	24,07	
Coil resistance (Ambient temp. 20 °C) Ω	BRN-WHT: 163,7	
	VLT-WHT: 68,84	
	VLT-ORG: 33,16	
	YEL-ORG: 73,55	
	YEL-PNK: 43,72	
Safety devices	Termal protector	
	Operating temp. Open °C	130 ± 8
	Close	79 ± 15
Run capacitor	µF	1,5
	VAC	440

Flap Motor	
Type	Stepping motor
Model	MP24Z2
Rating	DC 12 V
Coil resistance (Ambient temp. 25 °C) Ω	400 ± 7%

Heat Exch. Coil	
Coil	Aluminium plate fin / Copper tube
Rows	2
Fin pitch mm	1,3
Face area	0,25

DATA SUBJECT TO CHANGE WITHOUT NOTICE

MPAF228R5TAA

MPAF228C5TAA

Controller PCB	
Part No.	SAC ON-OFF IDU
Controls	Microprocessor
Control circuit fuse	250 V - 3,15 A
Jumper setting JP1..JP5	2,54mm-5pcs

Remote Control Unit	SAC W-REM
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Fan & Fan Motor	
Type	Cross - flow
Q'ty Dia. and lenght	1.... Ø 88 / L 746
Fan motor model...Q'ty	UF2Q-21SB5P...1
No. Of poles...rpm (230 V, Hi/Me/Lo)	2... 1550/1250/1025
Nominal output	24,07
Coil resistance (Ambient temp. 20 °C)	BRN-WHT: 163,7 VLT-WHT: 68,84 VLT-ORG: 33,16 YEL-ORG: 73,55 YEL-PNK: 43,72
Safety devices	termal protector
Type	
Operating temp. Open	130 ± 8
Close	79 ± 15
Run capacitor	1,5
	440

Flap Motor	
Type	Stepping motor
Model	MP24Z2
Rating	DC 12 V
Coil resistance (Ambient temp. 25 °C)	400 ± 7%

Heat Exch. Coil	
Coil	Aluminium plate fin / Copper tube
Rows	2
Fin pitch	1,3
Face area	0,25

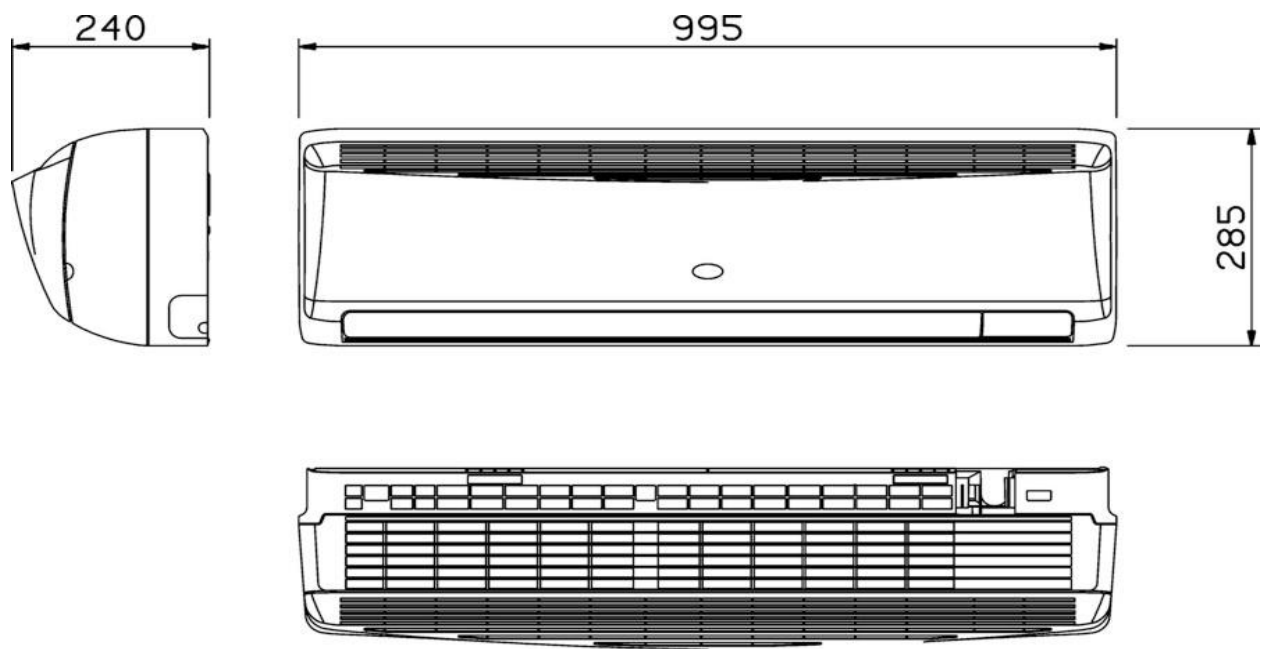
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1-3 Other Component Specifications

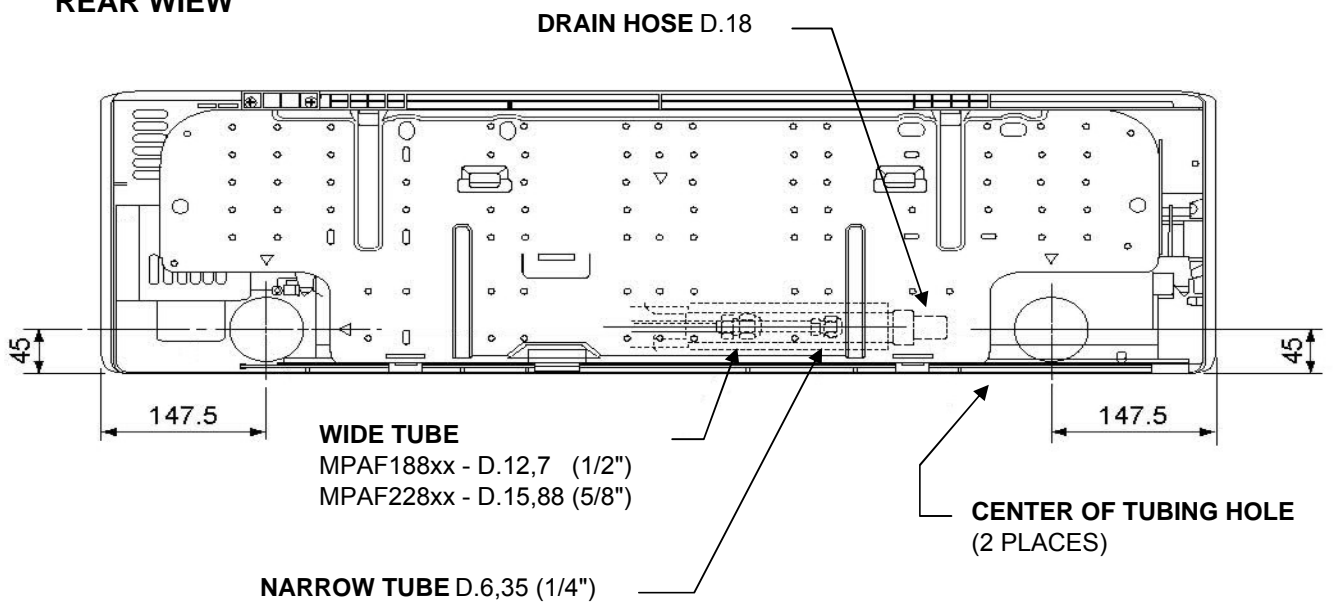
Trasformer (TR)		A040C5026AA
Rating	Primary Secondary	AC 230 V, 50 Hz 13 V - 5VA
Thermal cut-off temp. (PTC) (on the board)		C 883 - 120°C
Thermistor (Coil sensor)		NTC-THERMISTOR
Resistance	kΩ	10 at 25 °C
Thermistor (Room sensor)		NTC-THERMISTOR
Resistance	kΩ	10 at 25 °C

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2. DIMENSIONAL DATA



REAR VIEW



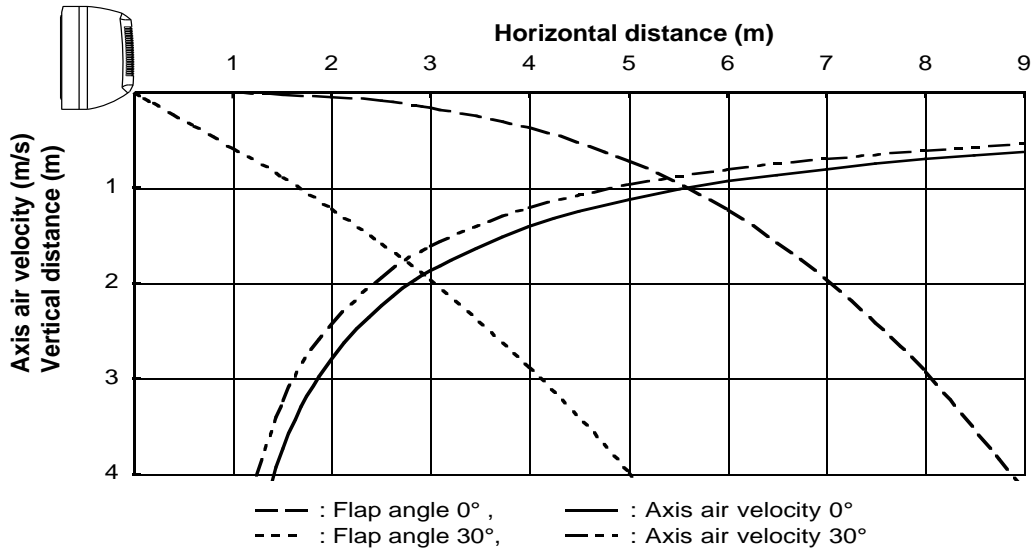
dimension in mm

3. PERFORMANCE DATA

3-1 Air Throw Distance Chart

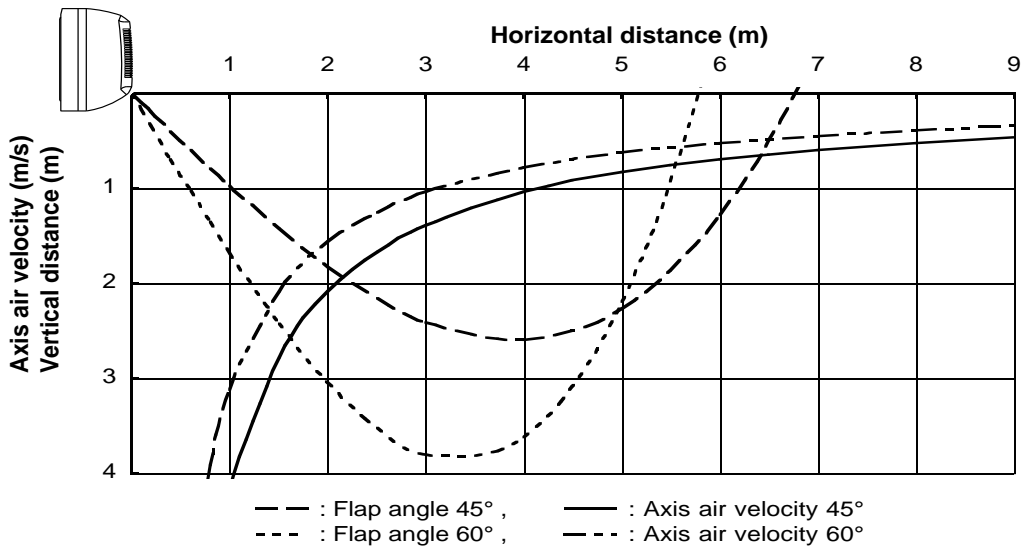
Cooling

Room air temp. : 27°C
 Fan speed : High



Heating

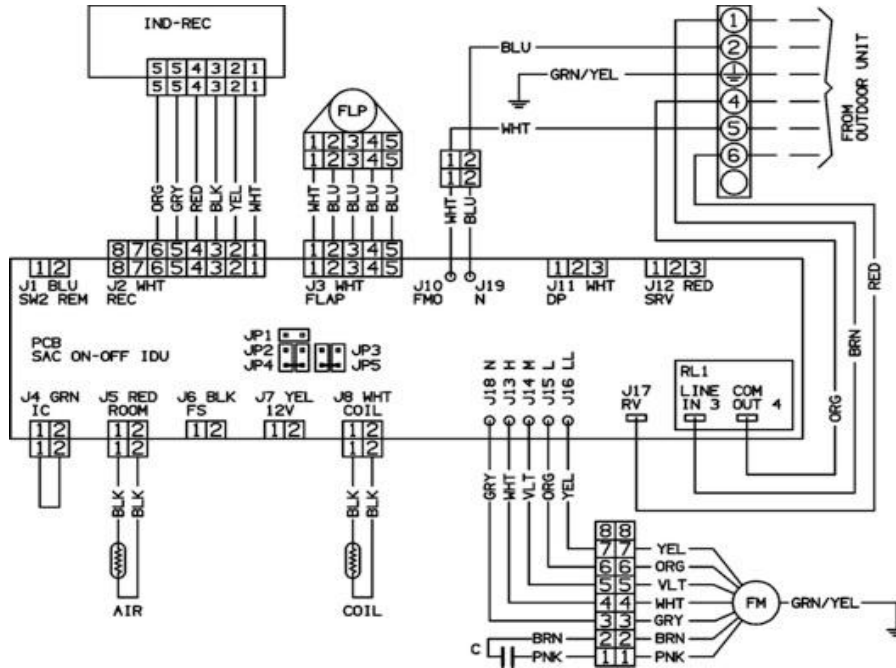
Room air temp. : 20°C
 Fan speed : High



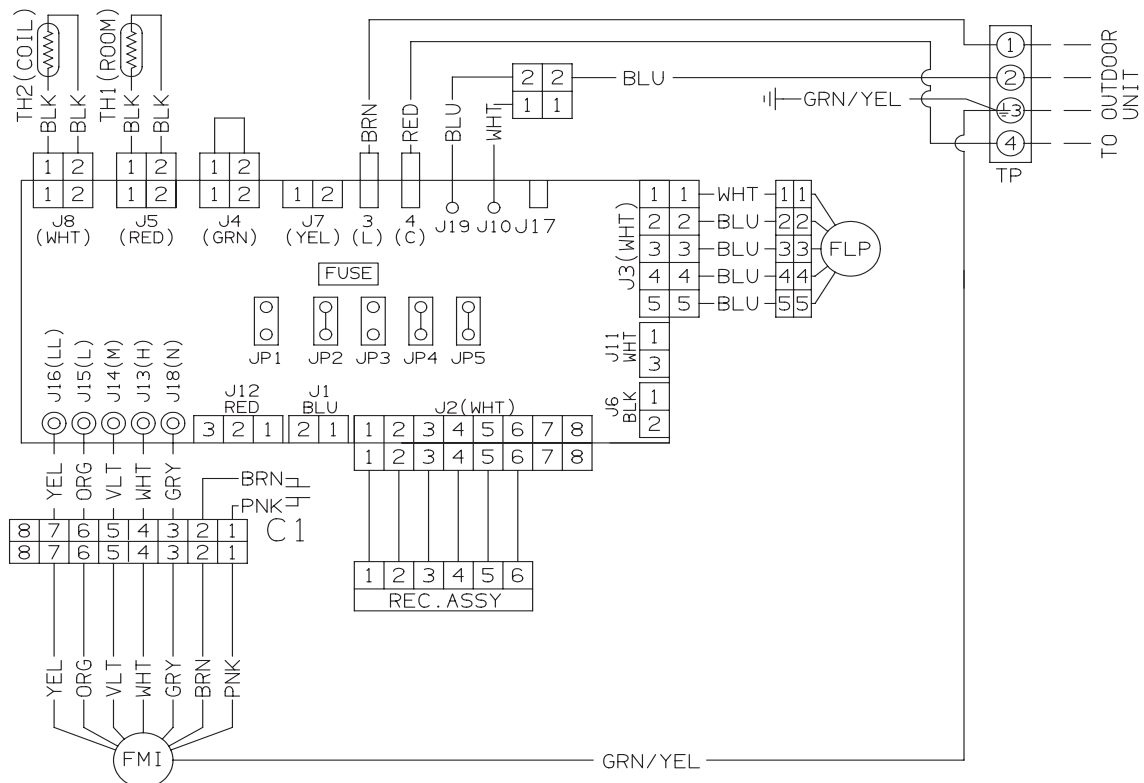
4. ELECTRICAL DATA

4-1 Electric Wiring Diagram

HEAT PUMP MODELS



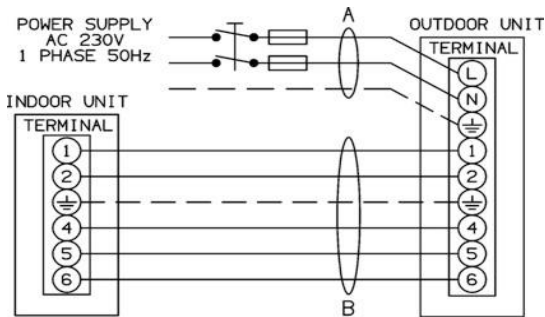
COOLING MODELS



4-2 Wiring System Diagram

HEAT PUMP MODELS

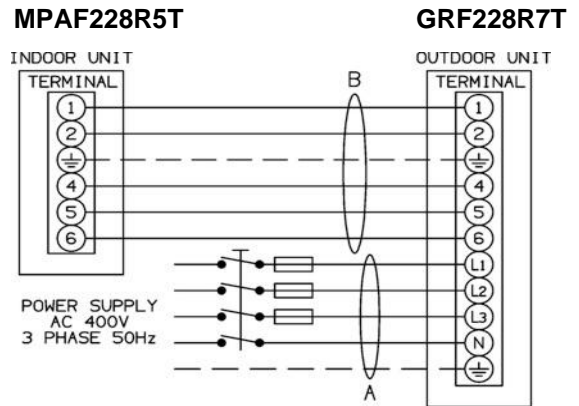
1-phase



MPAF188R5T
MPAF228R5T

GRF188R5T
GRF228R5T

3-phase

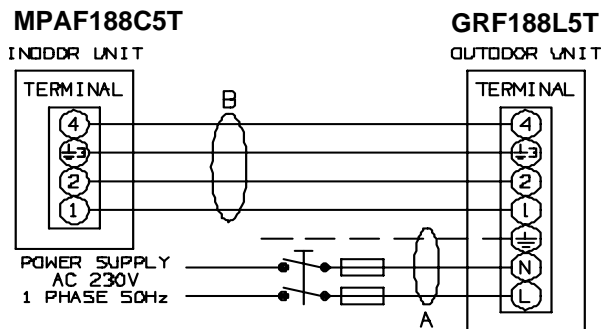


MPAF228R5T

GRF228R7T

COOLING MODELS

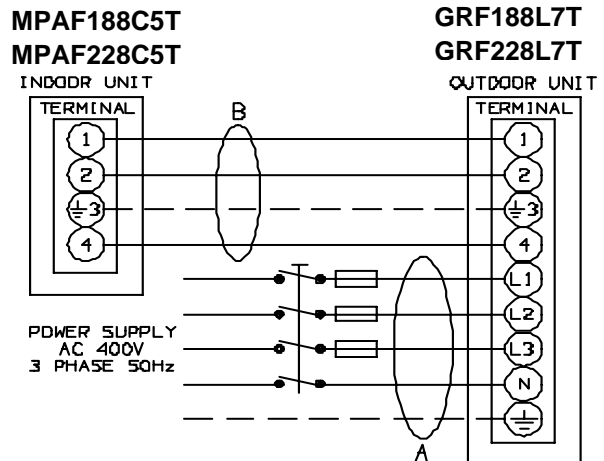
1-phase



MPAF188C5T

GRF188L5T

3-phase



MPAF188C5T
MPAF228C5T

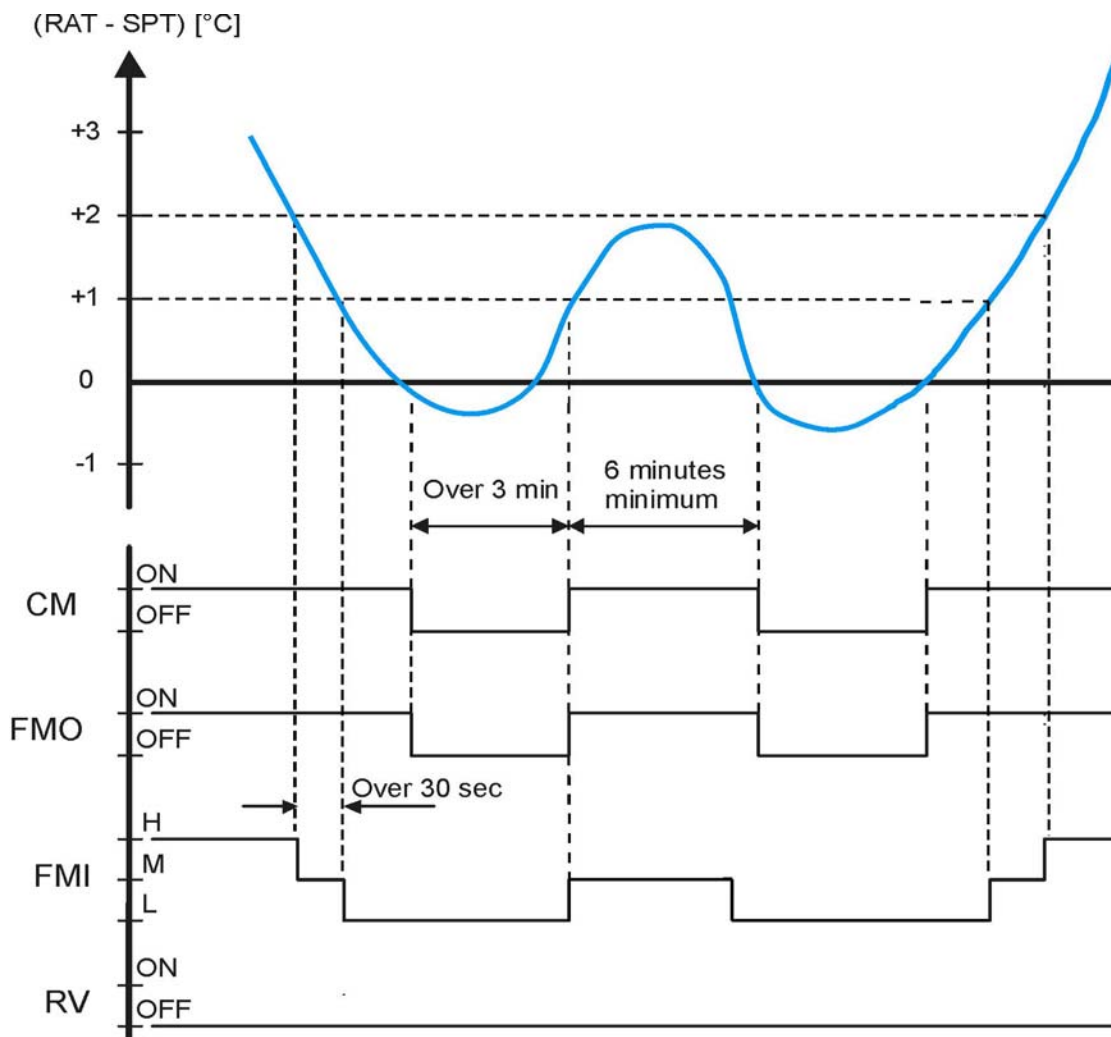
GRF188L7T
GRF228L7T

model	A		B		delayed fuse
	power supply m	mm ²	control line m	mm ²	
GRF188	15 (85 *)	2,5	25	1,5	16 A
GRF228	15 (65 *)		20		

* 3 Phase version

5.FUNCTION

5-1 Cool Mode Operation



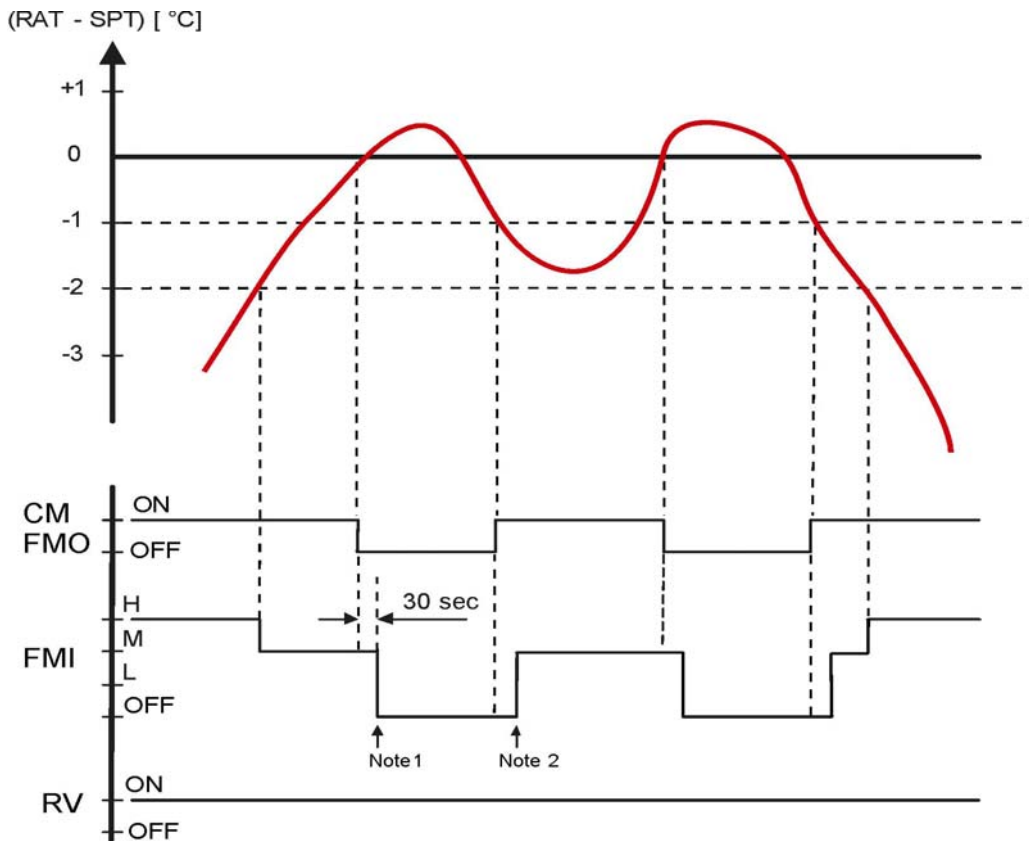
In Cooling Mode, the operation of the compressor (CM), Outdoor Fan (FMO) and Indoor Fan (FMI) are determined by the difference between the room air temperature (RAT) and the set point temperature (SPT) as shown in the graph.

NOTES

1. In this graph, the FMI is operating with the "Auto Fan Speed" setting. If the user has selected the Low, Medium or High fan speed, the FMI will run constantly at that speed only.
2. In addition to the temperature difference of above, the operations of the main components (CM, FMO, FMI) is also controlled by protection delays. That is:
 - the minimum off time of compressor is 3 minutes.
 - the minimum off time of compressor is 3 minutes.
 - the indoor fan can change speed only after it has operated at the same speed for 30 sec if in AUTO and 1 sec for the other settings (High, Med, Low).

5-2 Heat Mode Operation

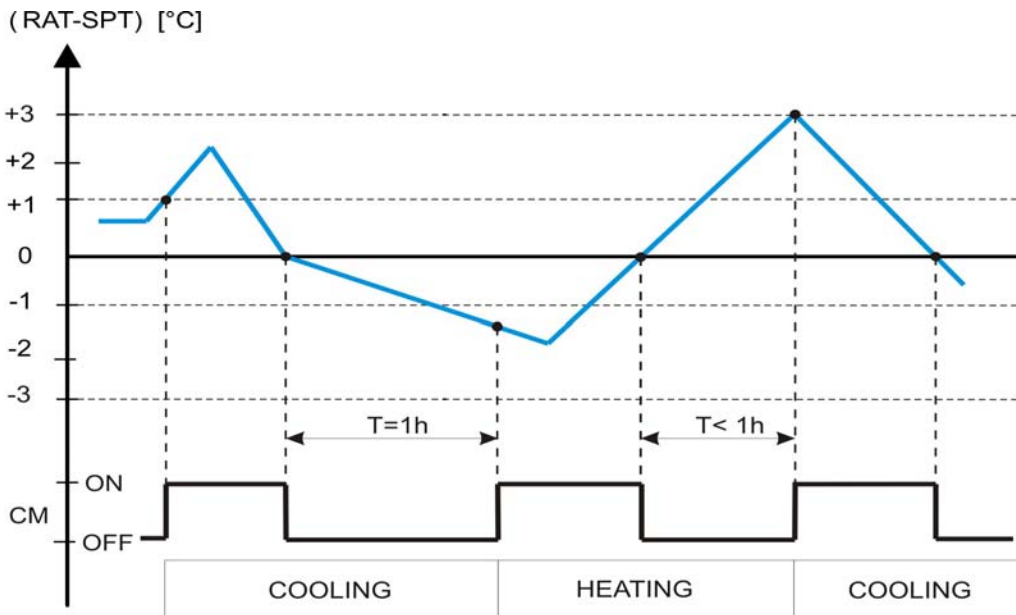
HEAT PUMP MODELS



The Heating mode operation is similar to the Cooling mode operation. The CM, FMO and FMI are mainly controlled by the value of $(RAT - SPT)$. In the graph above, the FMI is operating in AUTO speed mode. Therefore, the FMI speed changes automatically according to the $(RT - SPT)$.

NOTES

1. After the CM has stopped, the FMI runs for 30s in order to purge heat from the indoor coil.
2. The FMI will not be turned on until the indoor coil temperature is warm enough to prevent the supply of cool air (see COLD DRAFT PREVENTION feature for details).
The indoor fan can change speed only after it has operated at the same speed for 30 sec if in AUTO and 1 sec for the other settings (High, Med, Low).



In Auto Mode, the unit switches automatically between the Auto Cooling and Auto Heating in order to maintain the room temperature (RAT) at the prescribed set point (SPT).
 The switching between the two modes is according to the above graph.
 Refer to the sections 5.1 COOLING MODE and 5.2 HEATING MODE for system operation details.

5-4 Dry Mode Operation

Dry operation remove moisture from indoor air running, in cooling mode, at a low level without reducing the ambient temperature. This is done cycling ON and OFF indoor and outdoor units according to below.

ROOM TEMP	DRY LEVEL	
$\geq \text{SPT}+2^{\circ}\text{C}$	LEVEL 0	Operation according to COOLING mode
$< \text{SPT}+2^{\circ}\text{C}$ $\geq \text{SPT}-1^{\circ}\text{C}$	LEVEL 1	CM on FMO on FMI switches between L and off (30 seconds) RV off
$< \text{SPT}-1^{\circ}\text{C}$ $\geq 15^{\circ}\text{C}$	LEVEL 2	CM switches 9 minutes off and 3 minutes on FMO switches 9 minutes off and 3 minutes ON FMI switches off and L during CM operation RV off
$< 15^{\circ}\text{C}$	DRY OFF ZONE	CM off FMO off FMI off RV off

SPT = Set Point Temperature

5-5 Fan Mode Operation

With this mode, the indoor fan is turned on while CM, FMO and RV stay off all the time. The user can select between 3 speeds: HIGH, MEDIUM and LOW.

5-6 Auto Fan speed

With this option selected, the indoor fan speed changes automatically according to the difference between the detected air temperature (RAT sensor) and the set point (SPT):

COOLING MODE

$2 \leq (\text{RAT} - \text{SPT})$:	HIGH speed
$1 \leq (\text{RAT} - \text{SPT}) < 2$:	MEDIUM speed
$(\text{RAT} - \text{SPT}) < 1$:	LOW speed

HEATING MODE

$2 \leq (\text{SPT} - \text{RAT})$:	HIGH speed
$(\text{SPT} - \text{RAT}) < 2$:	MEDIUM speed

NOTE

SPT = Set Point Temperature

5-7 Forced Mode

In this mode the system operates (COOLING or HEATING mode – fixed settings) or is switched off by means of the MODE button of the indoor unit control board. The operation modes can be selected pressing the button in a cyclic way (OFF ⇒ COOL ⇒ HEAT ⇒ OFF...). The settings are:

COOLING mode

SET POINT temperature = 25°C

FAN SPEED = HIGH

HEATING mode

SET POINT temperature = 21°C

FAN SPEED = HIGH

5-8 Protection operations in Cool and Dry Mode

This protection prevents ice formation on the indoor coil heat exchanger. The protection is activated by the indoor coil temperature (ICT sensor) and only after 6 minutes of compressor operation. This protection acts in 2 levels:

LEVEL 1

INDOOR FAN SPEED: ANY (as selected from remote controller)

COMPRESSOR: ON

OUTDOOR FAN: cycling (30 seconds ON ⇒ 30 seconds OFF).

LEVEL 2

INDOOR FAN SPEED: ANY (as selected from remote controller)

COMPRESSOR: OFF for at least 6 minutes and until ICT ≥ 8°C

OUTDOOR FAN: OFF for at least 6 minutes and until ICT ≥ 8°C

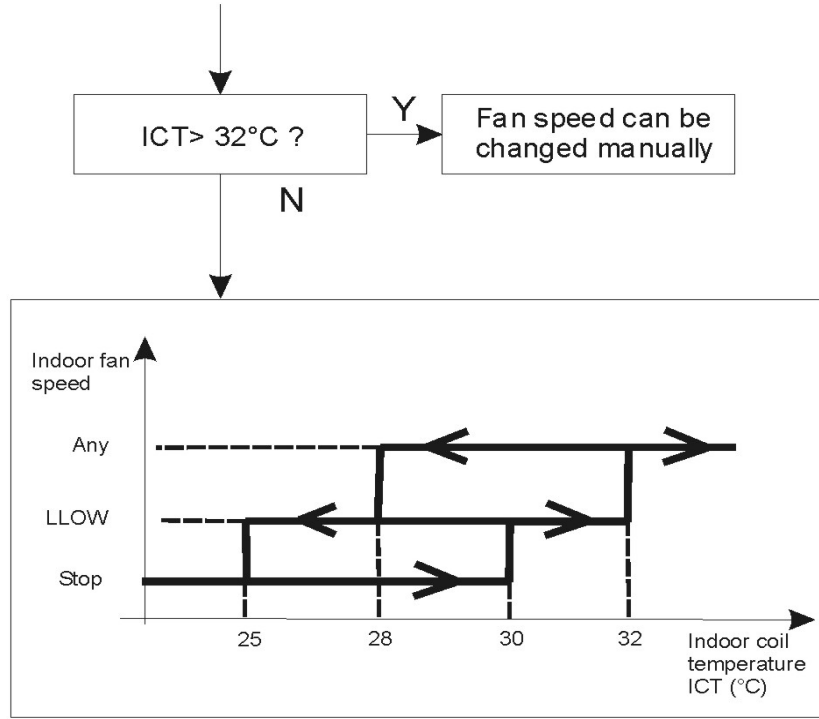
The system exit this protection routine when ICT temperature rises above 8°C.

5-9 Protection operations in Heat Mode

HEAT PUMP MODELS

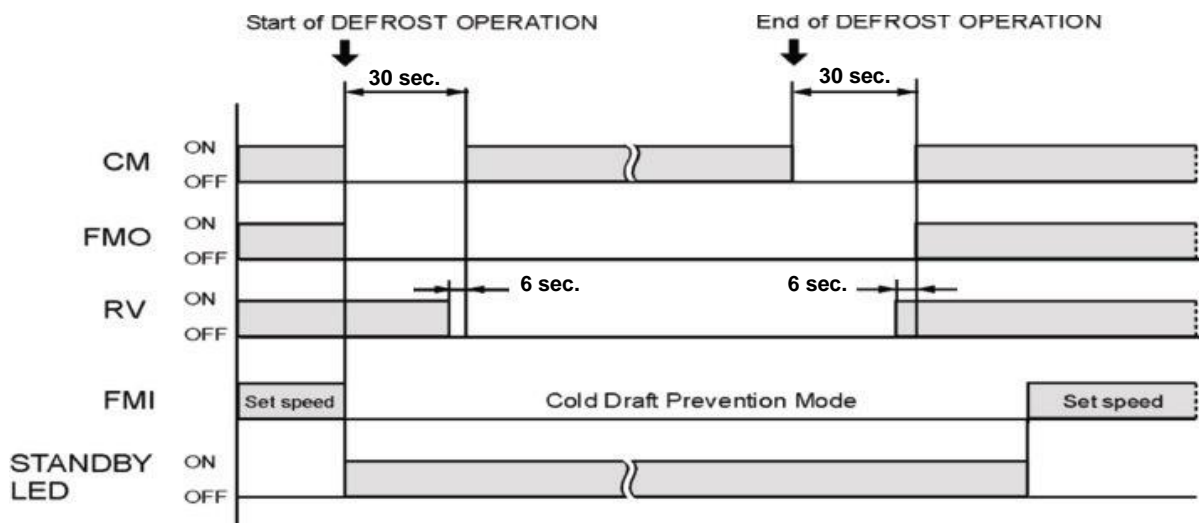
5-9.1 Cold draft

This feature prevents the supply of cold air forcing the indoor fan to a speed which cannot be changed by the user. As soon as the protection mode is exited speed can be changed manually through the remote controller. The protection acts in the following



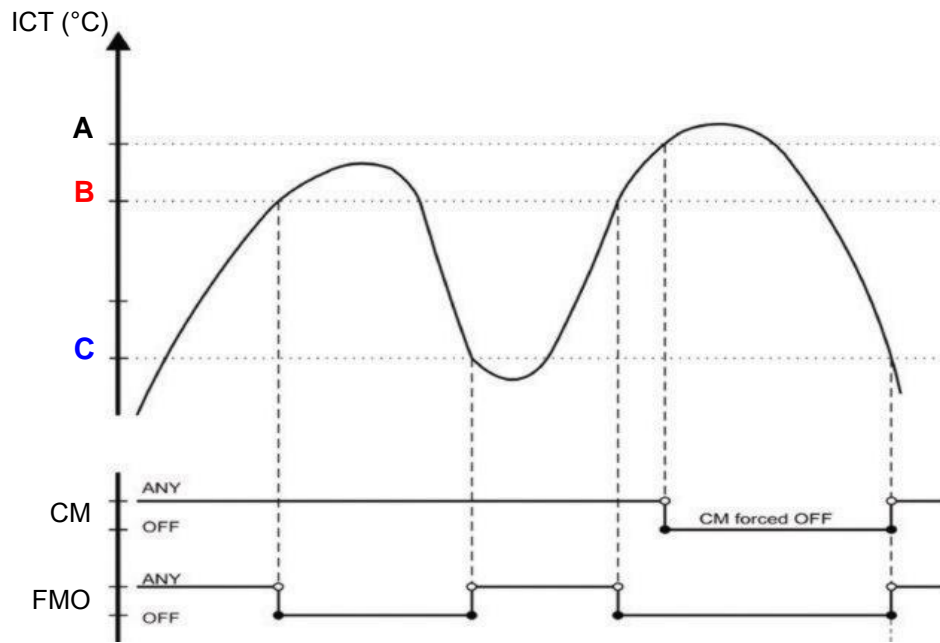
5-9.2 Defrost

The defrost process is controlled by a detection algorithm designed in order to maintain optimal utilization of the heat pump capacity especially during negative outdoor temperature conditions. During DEFROST OPERATION the main components operate according to the following chart:



5-9.3 Overheat

This feature prevents the build up of high pressure in the indoor heat exchanger during heating operation



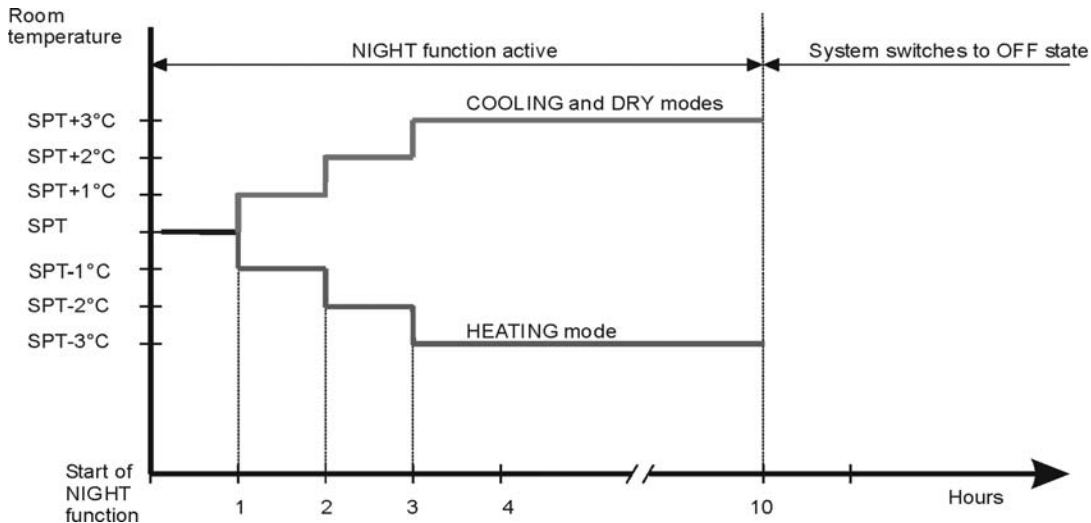
	MPAF188R5	MPAF228R5
A (°C)	60	60
B (°C)	55	54
C (°C)	49	49

5-10 I FEEL Function

As standard configuration the air conditioner operates detecting the room temperature through the sensor equipped in the wireless remote controller (icon I FEEL shown on the display). This feature provides a personalised environment since the temperature can be detected where the remote controller is located. It is possible to de-activate this option pressing the I FEEL button on the remote controller. In this case the I FEEL icon is no longer displayed and room temperature is detected through the sensor included in the indoor unit.

5-11 NIGHT Function

When this function is active, room temperature changes automatically to compensate for body temperature variations while sleeping. After 10 hours of operation system switches automatically to OFF state. This mode of operation is available both in COOLING and HEATING mode.



5-12 Diagnostic

With this feature is possible to have a visual signal that a trouble is occurring.
This mode is always active and the signalling is made through the display board LEDS .
In case of no troubles the LEDS status follows its normal function.

NOTES

- The troubles are showed according a priority list that is in case of more than one trouble present, is always showed, at first, the one with the highest priority (1 ⇒ 2⇒ 3 etc).
- Sensor damaged means a situation where sensor is short-circuited or opened.
- In case of damaged sensors, the system (CM, FMO, FMI etc), if in OFF state, does not start.

Priority	TROUBLE	LEDS status			Effects
		LD1(stby)	LD2(opr)	LD3(timer)	
2	RAT damaged	F	O	O	System does not operate
3	ICT damaged	F	F	O	

O = LED off

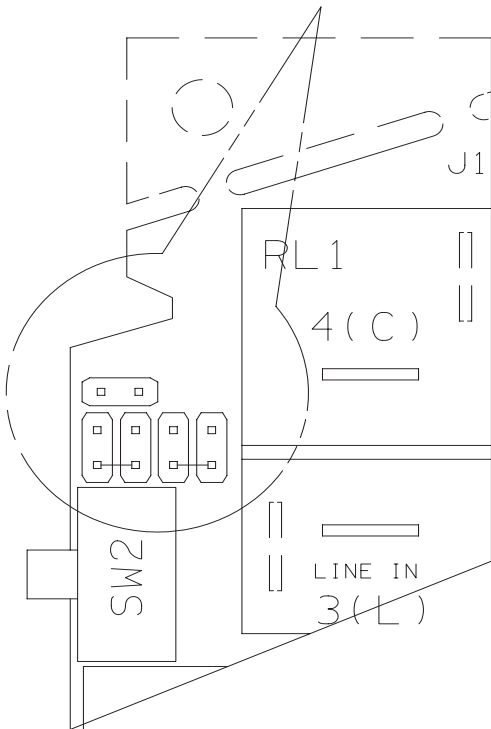
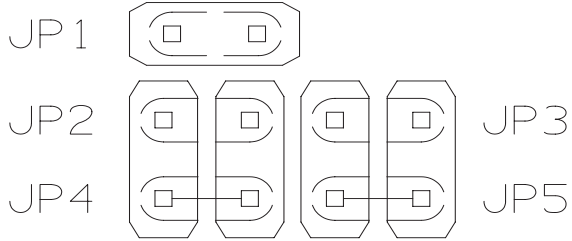
● = LED on

F = LED blinking

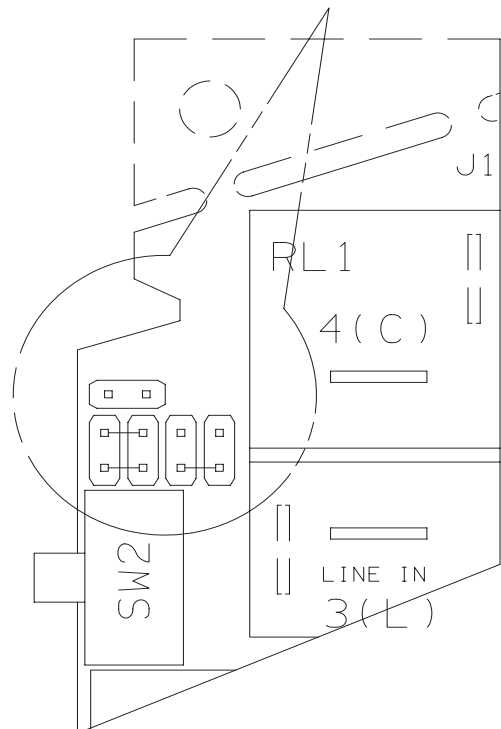
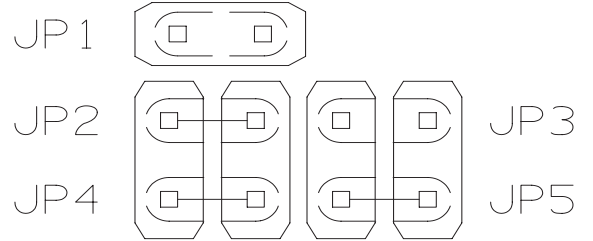
5-13 JUMPERS CONFIGURATION

Jumpers are located on the indoor PCB near the MODE button.

HEAT PUMP MODELS



COOLING MODELS



Unit is shipped with jumpers set according to the following table:

JUMPER	STATUS	
	HEAT PUMP MODELS	COOLING MODELS
JP1	open	open
JP2	open	closed
JP3	open	open
JP4	closed	closed
JP5	closed	closed

5-14 Contacts for Building Automation

5-14.1 INPUT CONTACT (J4 - green)

The status of this input affects system operation according to the following:

Contact OPEN : system does not operate (always OFF) – inputs from wireless remote controller are not processed

Contact CLOSED: system operates in the normal way according to the inputs coming from wireless remote controller

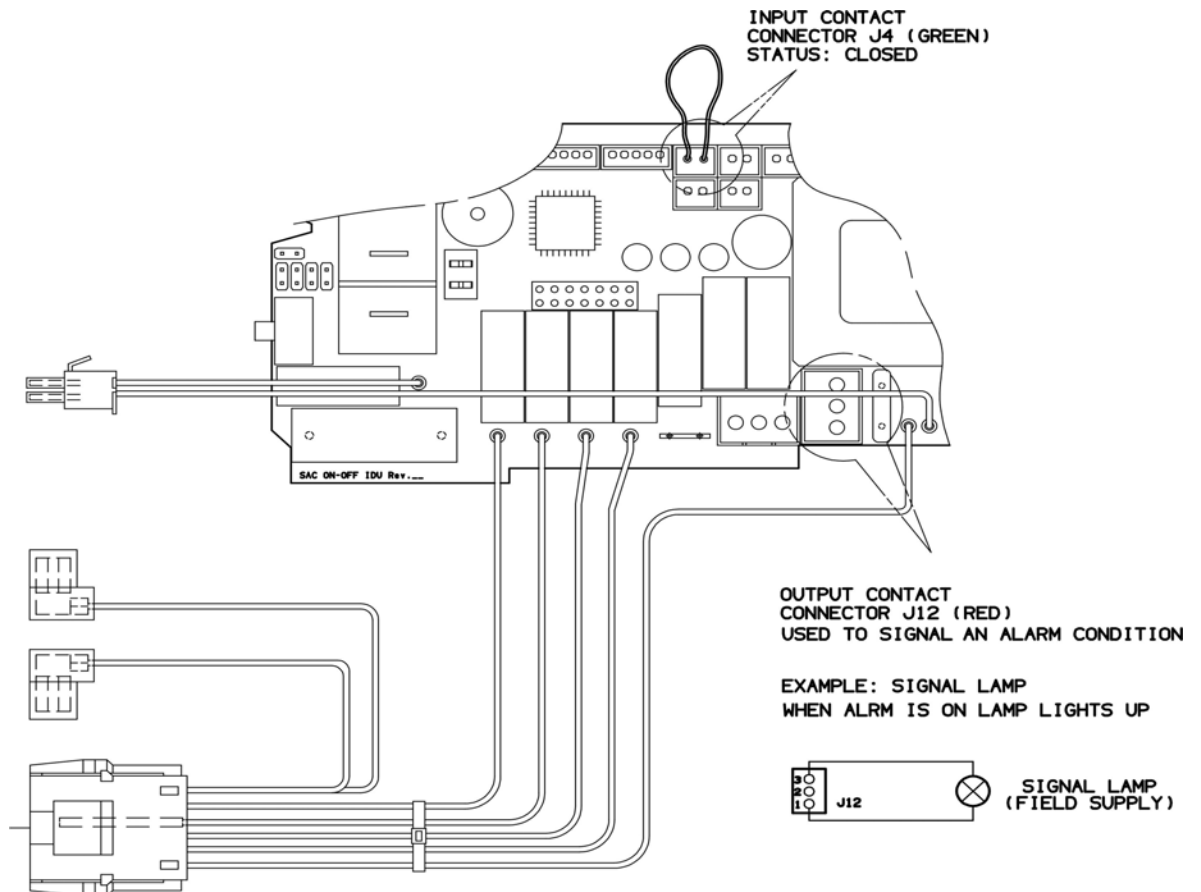
5-14.2 OUTPUT CONTACT (J12)

This connector is directly tied to the contact (normally open) of a power relay which activates every time the following alarm condition occur:

- RAT damaged
- ICT damaged

In this case when alarm happens, on poles 1 and 3 of J12 connector, 220 VAC-50Hz are available.

Max electrical load: **1A- 240VAC**



5-15 Maintenance

Changing the Address of the Air Conditioner

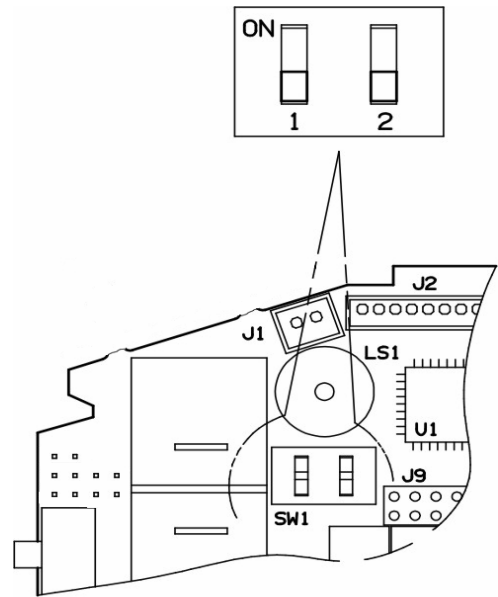
In case of more than one air conditioner operating in the same room, it may be necessary to assign an address to each unit in order to avoid operation conflicts. Address is set acting on the dip-switches located on the indoor PCB and on the remote controller. The PCB settings must match the corresponding ones on the wireless remote controller.

How to change address of the air conditioner

Dip switch is located on the indoor PCB near the buzzer.
Set the PCB to the address desired

UNIT ADDRESS	SETTINGS	
	SW1	SW2
1	off	off
2	off	on
3	on	off
4	on	on

As default switches SW1 and SW2 are in off status (PCB factory state).

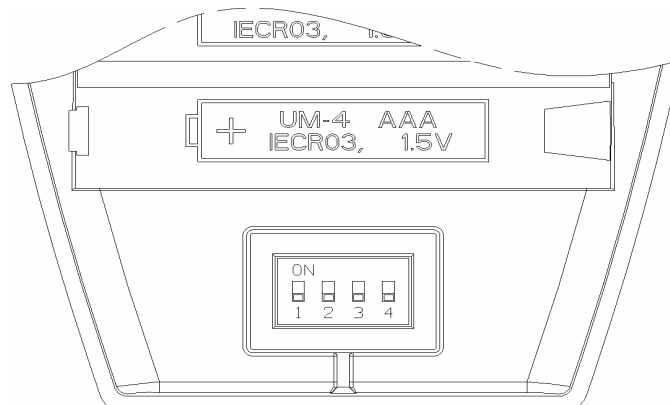


How to change address on Remote Control Unit

Dip switch is located on the battery compartment.

- 1) Pull out the door and remove the batteries.
- 2) Set the switch SW1 and SW2 according to the indoor PCB settings (do not act on SW3 and SW4)
- 3) Insert the batteries and pull on the door

As default switches SW1 and SW2 are in off status (remote controller factory state).



6 TROUBLESHOOTING

6-1 Check Before and After Troubleshooting

(A) Check power supply wiring.

- Check the power supply wires are correctly connected.

(B) Check power supply.

- Check that voltage is in specified range ($\pm 10\%$ of the rating).
- Check that power is being supplied.

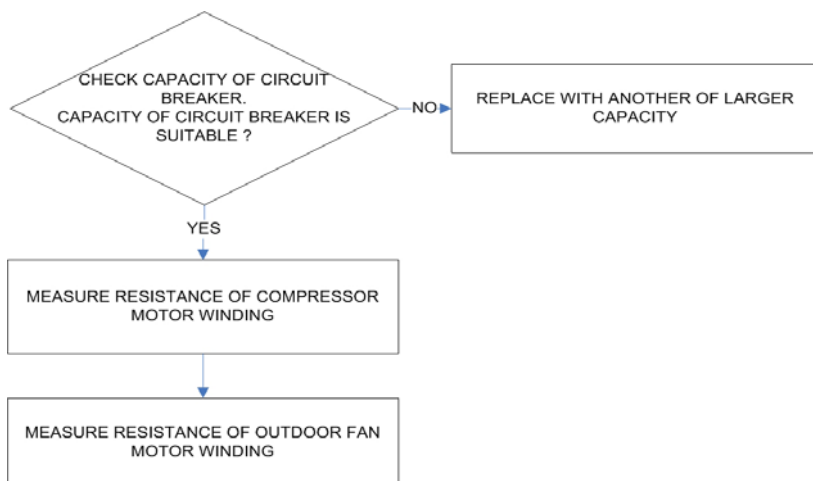
• **WARNING:** If the following troubleshooting must be done with power supplied, be careful not to touch any uninsulated live part that can cause *electric shock*

6-2 Circuit Breaker Trips or Fuse Blows

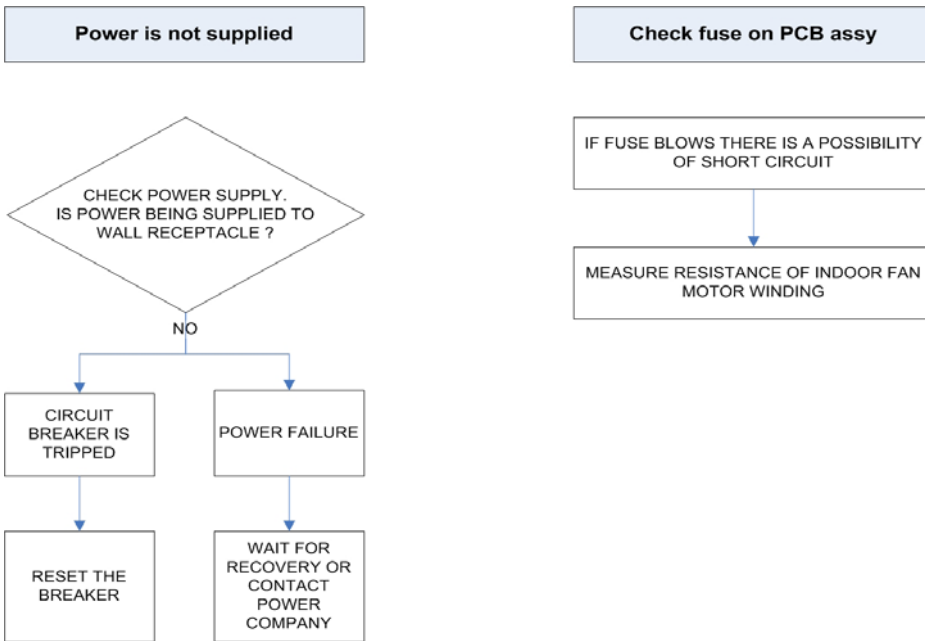
- When circuit breaker is set to ON, it trips in a few moments. Resetting is not possible.
- Measure insulation resistance. There is a possibility of ground fault.
If resistance value is 1 Mohm or less, insulation is defective.

6-3 Circuit Breaker Trips in Several Minutes After Turning Air Conditioner On

- 1 • There is the possibility of short circuit.



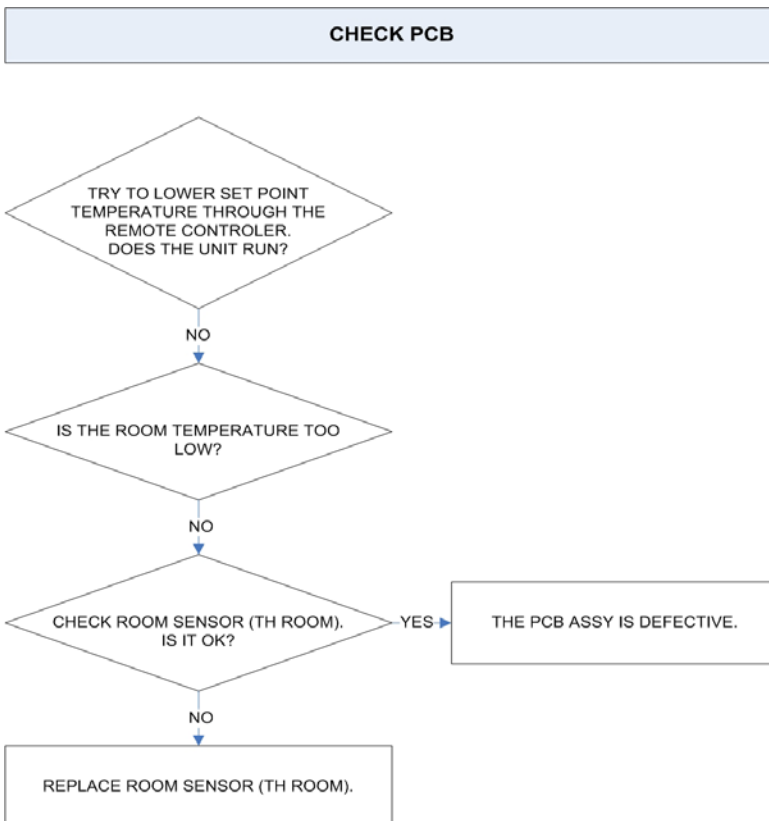
2 • The unit does not run.



6-4 Unit and Compressor Do Not Run

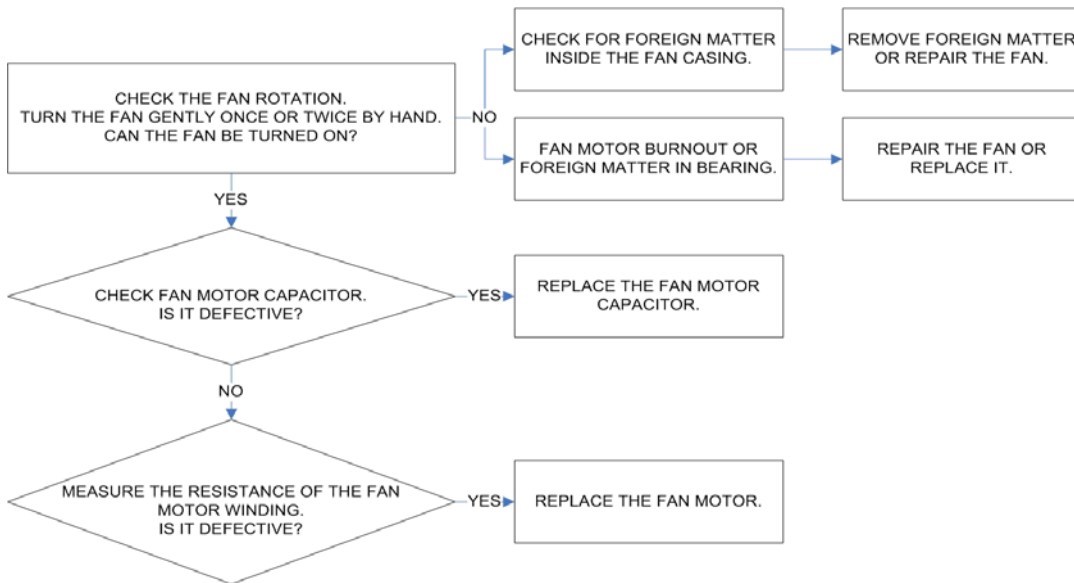
The unit does not run when air conditioner is in the following conditions:

- When the room temperature is below the setting temperature.
- During the protection modes.

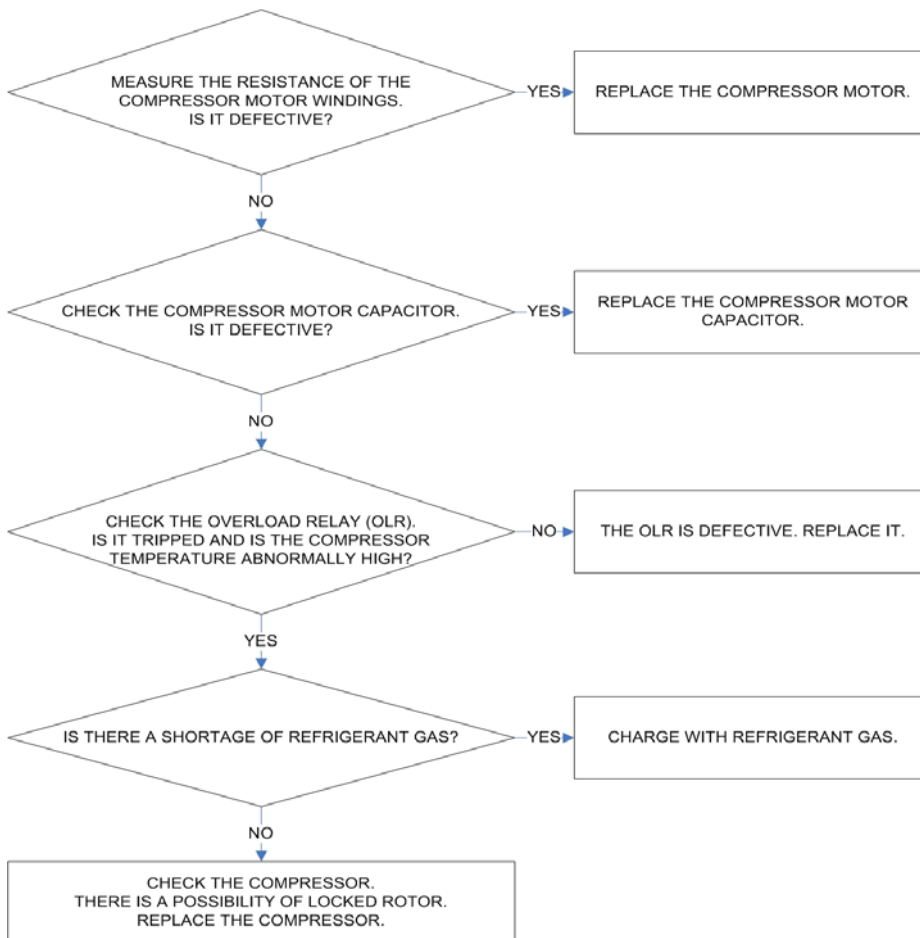


6-5 Some Parts of the Air Conditioner Do Not Operate

INDOOR / OUTDOOR FAN DOES NOT RUN

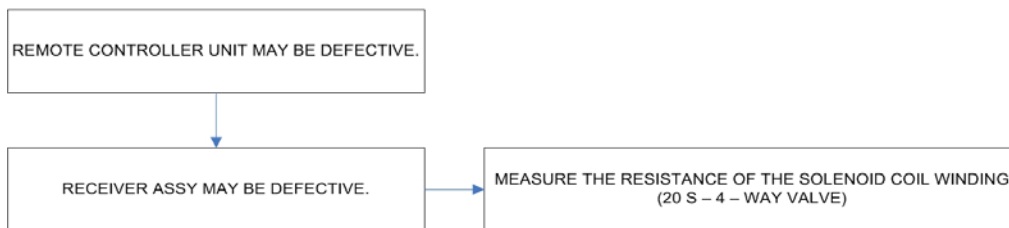


COMPRESSOR MOTOR DOES NOT RUN



6-6 Air Conditioner Operates, but Abnormalities are Observed

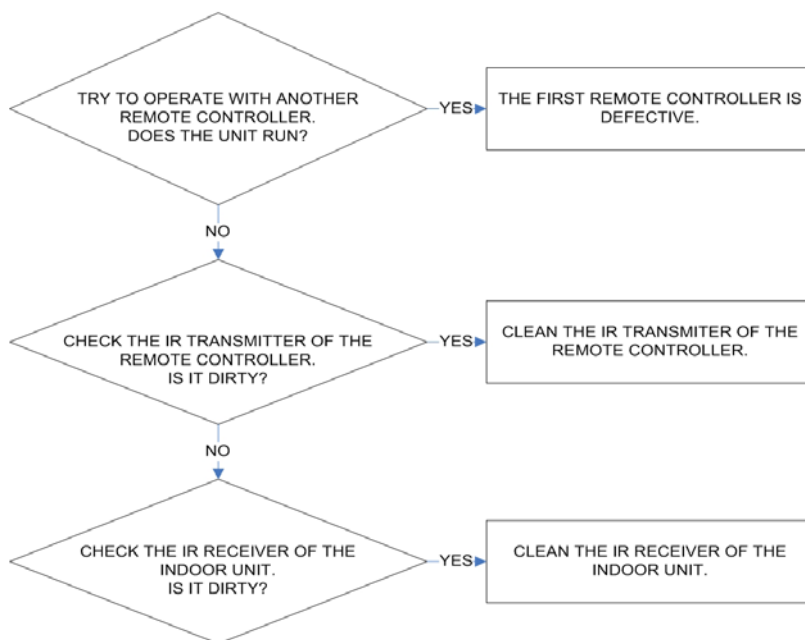
OPERATION DOES NOT SWITCH FROM HEAT TO COOL AND/OR FROM COOL TO HEAT



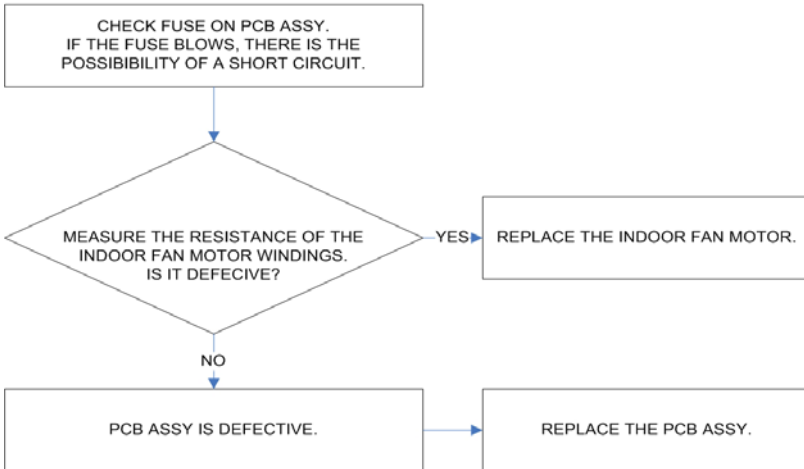
CHECK "MODE BUTTON" ON THE UNIT



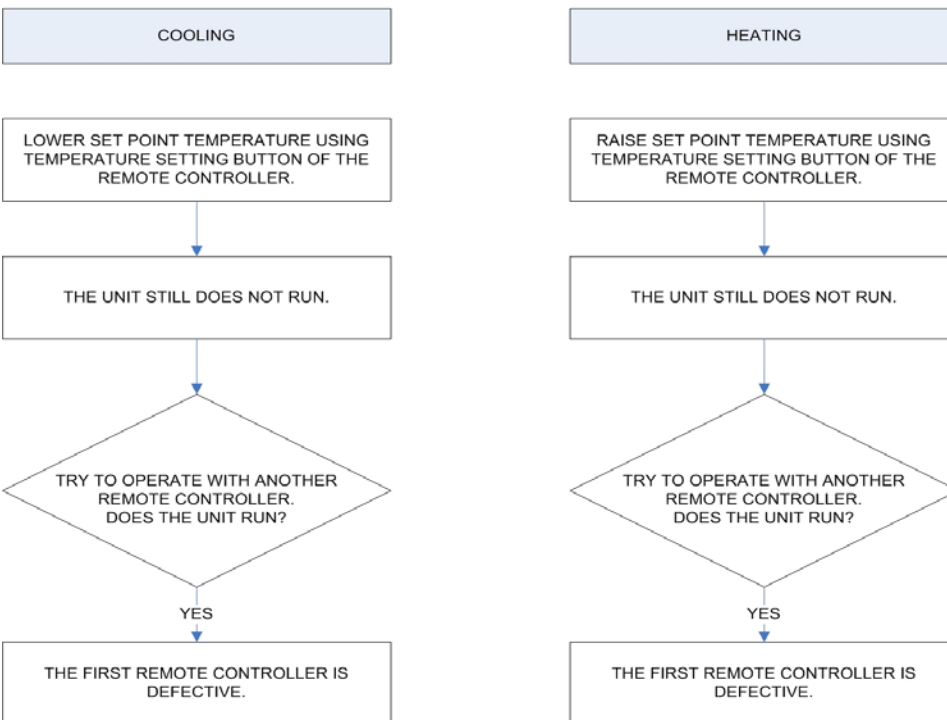
CHECK REMOTE CONTROL UNIT



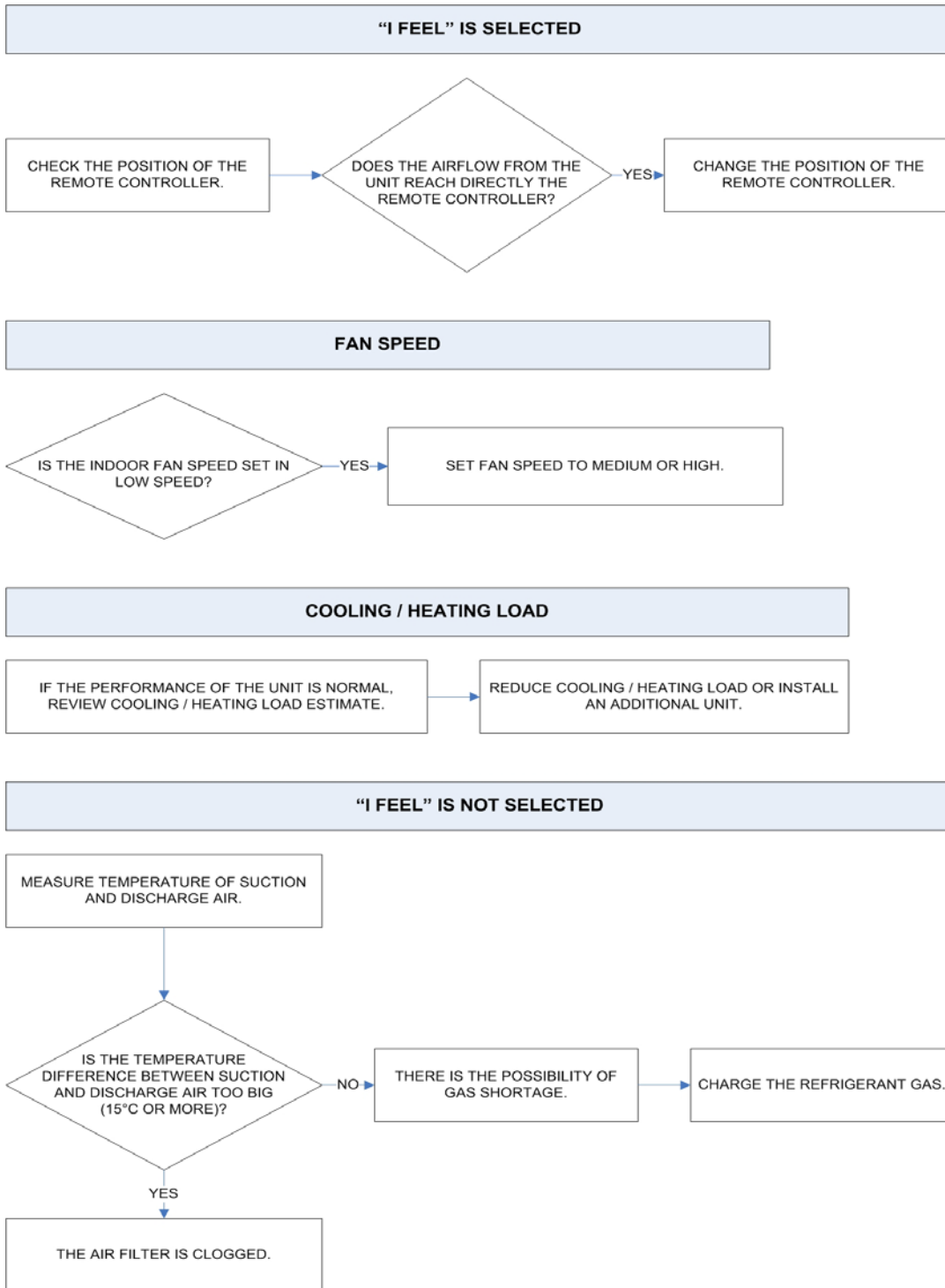
CHECK FUSE ON PCB ASSY IN THE UNIT



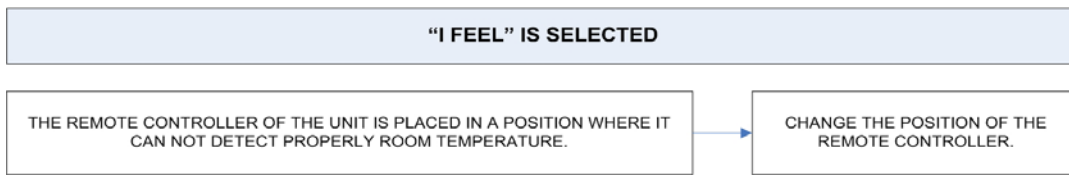
CHECK SETTING TEMPERATURE



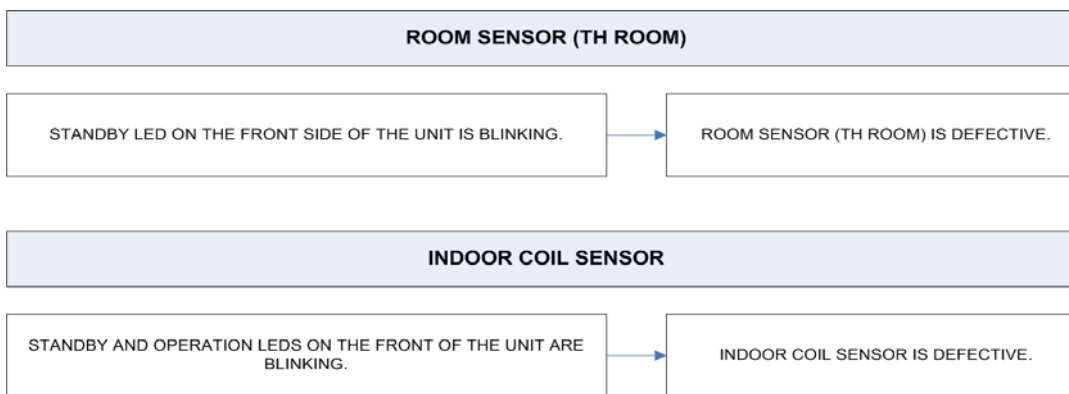
6-7 Poor Cooling or Heating



6-8 Excessive Cooling or Heating



6-9 A Sensor Is Defective



7 CHECKING ELECTRICAL COMPONENTS

7-1 Measurement of Insulation Resistance

The insulation is in good condition if the resistance exceeds 1 MOhm

a) Power Supply Wires

Clamp the earthed wire of the power supply wires with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on either of the power wires (fig.1).

Then measure the resistance between the earthed wire and the other power wires (fig.1).

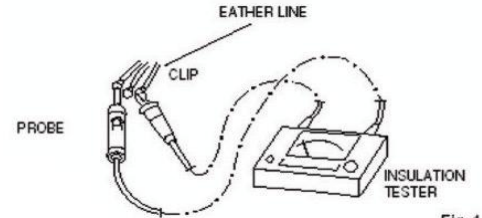


Fig. 1

b) Unit

Clamp an alluminium plate fin or copper tube with the lead clip of the insulation resistance tester and measure the resistance by placing a probe on N terminal, and then on Lterminal the terminal plate (fig.2)

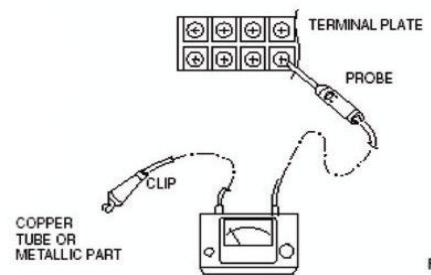


Fig. 2

c) Measurement of Insulation Resistance for Electrical Parts

Disconnect the lead wires of the disired electric part from terminal plate, PCB assy, capacitor, etc. Similary disconnect the connector. Then measure the insulation resistance (fig.1 to 4).

Refer to electric wiring diagram.

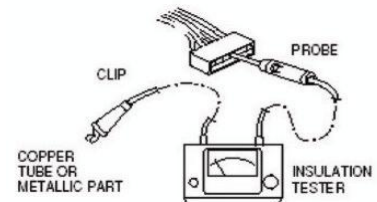


Fig. 3

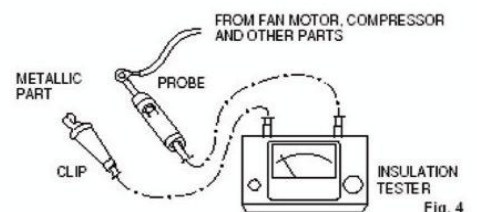


Fig. 4

NOTE

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

7-2 Checking Continuity of fuse on PCB assy

Remove PCB assy from electrical component box (fig.5)

Then pull out the fuse from PCB assy

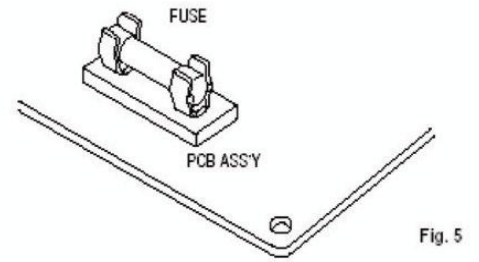


Fig. 5

Check continuity of fuse by the multimeter (fig.6)

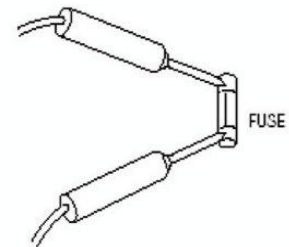


Fig. 6

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 capacity of the capacitor.

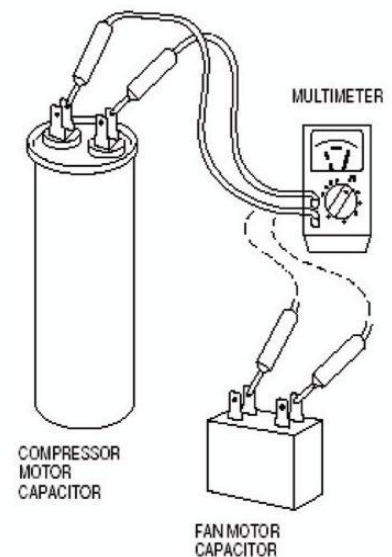


Fig. 7



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