



# **TECHNICAL SEMINAR**

## **Air-Conditioner**



**CU/CS-UE9/12/18QKE  
CU/CS-RE9/12/18/24NKE &  
SUPER TROPICAL INVERTER (CU/CS-K18/24NKF)**

**IRAN**

**26<sup>th</sup> Feb. 2018**

**Panasonic**



## SEMINAR OUTLINE

### ☐ Introduction

- ☐ Product range and model variants

### ☐ Operation condition

- ☐ (Uses of AC under temperature range)

### ☐ Product & Piping specification

- ☐ (capacity, performance & piping condition)

### ☐ Refrigerant cycle & characteristic

- ☐ (Sensor function ,cooling &Heating characteristic)

### ☐ Block &Wiring diagram

- ☐ (Outline of electrical component /AC-DC flows)

### ☐ Inverter Technology

- ☐ (AC-DC/Compressor Illustration flows)

### ☐ Auto cooling system for super tropical inverter

- ☐ (layout and working mechanism)

### ☐ Safety protection control

- ☐ (IPM, Expansion valve, overload , cold draft , auto-restart, de-ice etc.)

### ☐ Trouble Shooting guides-General

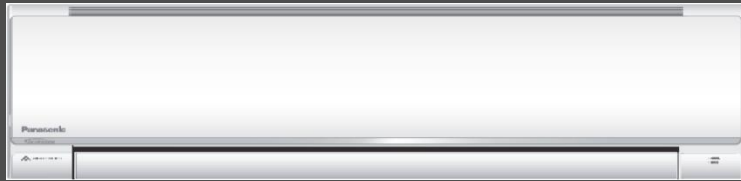
- ☐ (precaution tips and preparation)

### ☐ Trouble shooting guides (Error code H11-F99)

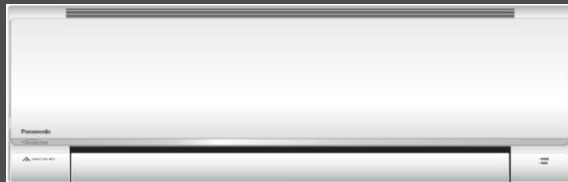
- ☐ (Failure judgement condition and root causes)

## STANDARD COOLING & HEAT PUMP-INVERTER

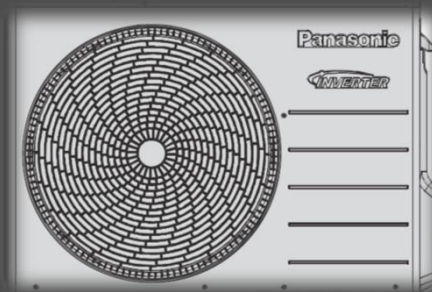
### CS/CU-UE18QKE



### CS/CU-UE9/12QKE

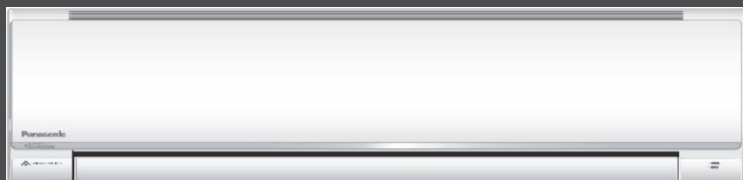


- Inverter Technology
  - Wider output range
  - Energy Saving
  - More precise temperature control
- Environment protection
- Long Installation pipe
- Safety protection control
- Serviceability Improvement
  - Breakdown Self Diagnosis Function



## STANDARD COOLING & HEAT PUMP-INVERTER

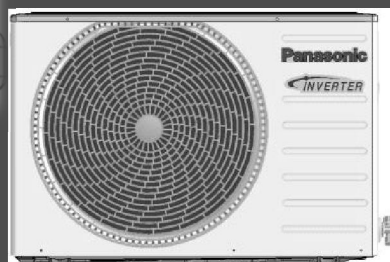
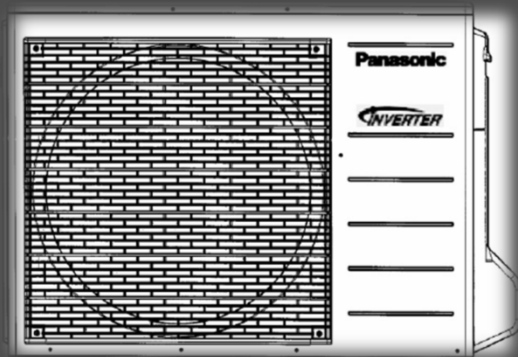
### CS/CU-RE18/24NKE



### CS/CU-RE9/12/15NKE



- Inverter Technology
  - Wider output range
  - Energy Saving
  - More precise temperature control
- Environment protection
- Long Installation pipe
- Safety protection control
- Serviceability Improvement
  - Breakdown Self Diagnosis Function
- **Anti Bacterial Filter**



**Panasonic**

2013 (PAPAGZ)



## SUPER TROPICAL INVERTER

### CS-K18/24NKF



### CU-K18/24NKF



- Inverter Technology
  - Wider output range
  - Energy Saving
  - More precise temperature control
- Environment protection
- Long Installation pipe
- Safety protection control
- Serviceability Improvement
  - Breakdown Self Diagnosis function
- Econavi –Optimize energy saving
- Auto comfort – Maximise comfort
- Powerful/ Quiet /Dual timer
- **Higher performance (Super Tropical 55°C**
- **Unique auto cooling protection (Outdoor unit)**



## OPERATION CONDITION FOR INDOOR & OUTDOOR

### CS/CU-UE9/12QKE

Use this air-conditioner under the following temperature range :

Temperature (°C)		Indoor		CU-RE9KE,CU-RE12QKE,CU-RE15QKE		CU-UE9KE,CU-U12QKE,CU-YE9QKE ,CU-YE12QKE	
		DBT	WBT	DBT	WBT	DBT	WBT
Cool	Max.	32	23	43	26	43	26
	Min.	16	11	-10	-	5	-
Heat	Max.	30	-	24	18	24	18
	Min	16	-	-15	-16	-10	-11

### CS/CU-UE18/24QKE

Temperature (°C)		Indoor		CU-RE18QKE CU-RE24QKE		CU-UE18QKE	
		DBT	WBT	DBT	WBT	DBT	WBT
Cool	Max.	32	23	43	26	43	26
	Min.	16	11	-10	-	5	-
Heat	Max.	30	-	24	18	24	18
	Min	16	-	-15	-16	-10	-11

## OPERATION CONDITION FOR INDOOR & OUTDOOR

### CS/CU-RE9/12/15NKE

Temperature (°C)		Indoor		Outdoor	
		DBT	WBT	DBT	WBT
Cool	Max.	32	23	43	26
	Min.	16	11	16	11
Heat	Max.	30	-	24	18
	Min	16	-	-5	-6

### CS/CU-RE18/24NKE

Temperature (°C)		Indoor		Outdoor CU-RE18NKE CU-RE18NKX		Outdoor CU-RE24NKE CU-RE24NKX	
				DBT	WBT	DBT	WBT
Cool	Max.	32	23	43	26	43	26
	Min.	16	11	5	4	16	11
Heat	Max.	30	-	24	18	24	18
	Min	16	-	-5	-6	-5	-6

## OPERATION CONDITION FOR INDOOR & OUTDOOR

### CS/CU-K18NKF & CS/CUK24NKF (Super tropical inverter)

Use this air-conditioner under the following temperature range :

Items		CS/CU-K18NKF		CS/CU-K24NKF	
		DBT	WBT	DBT	WBT
Indoor Operation range	Max.	32	23	32	23
	Min.	16	11	16	11
Outdoor Operation range	Max.	55	31	55	31
	Min	16	11	16	11

# **PRODUCT SPECIFICATION**

## PRODUCT SPECIFICATION

STANDARD COOLING & HEAT PUMP-INVERTER										
MODEL	INDOOR	CS-UE9QKE			CS-UE12QKE			CS-UE18QKE		
	OUTDOOR	CU-UE9QKE			CU-UE12QKE			CU-UE18QKE		
PERFORMANCE TEST		EUROVENT			EUROVENT			EUROVENT		
POWER SUPPLY	PHASE, Hz	SINGLE, 50			SINGLE, 50			SINGLE, 50		
	V	230			230			230		
		MIN	MID	MAX	MIN	MID	MAX	MIN	MID	MAX
CAPACITY	BTU/Hr	2730	11300	14000	2730	13600	17400	3340	17100	19100
	kW	690	2840	3530	690	3440	4390	980	5000	5600
RUNNING CURRENT	A		3.2			4.8			6.9	
INPUT POWER	W	250	720	1020	255	1090	1280	285	1540	1750
ANNUAL CONSUMP.	KWh		360			545			770	
EER	W/W	3.4	3.47	2.94	3.33	3.21	3.05	3.44	3.25	3.2
	BTU/Hw	11.6	11.85	10	11.37	10.92	10.39	11.72	11.1	10.91
CAPACITY	Kw	0.85	2.5	3	0.85	3.5	3.9	0.98	5.4	7.7
	BTU/Hr	2900	8530	10200	730	11900	13300	3340	18400	26300
RUNNING CURRENT	A		3.8			4.9			6.7	
INPUT POWER	W	195	860	1180	200	1110	1470	350	170	2300
COP	W/W	4.1	3.8	3.47	4	3.64	3.47	2.8	3.67	3.35
	BTU/Hw	14	13.14	11.86	13.65	12.36	11.84	9.54	12.52	11.43



## PRODUCT SPECIFICATION

### STANDARD COOLING & HEAT PUMP-INVERTER

MODEL	INDOOR	CS-RE9NKE			CS-RE12NKE			CS-RE15NKE			CS-RE18NKE			CS-RE24NKE		
	OUTDOOR	CU-RE9NKE			CU-RE12NKE			CU-RE15NKE			CU-RE18NKE			CU-RE24NKE		
PERFORMANCE TEST		EUROVENT			EUROVENT			EUROVENT			EUROVENT			EUROVENT		
POWER SUPPLY	PHASE, Hz	SINGLE, 50			SINGLE, 50			SINGLE, 50			SINGLE, 50			SINGLE, 50		
	V	230			230			230			230			230		
		MIN	MID	MAX	MIN	MID	MAX	MIN	MID	MAX	MIN	MID	MAX	MIN	MID	MAX
CAPACITY	BTU/Hr	3070	8530	10230	3070	11940	13300	3410	14330	15700	3340	17100	20500	3340	23200	27600
	kW	0.9	2.5	3	3	0.9	3.5	1	4.2	4.6	0.98	5	6	0.98	6.8	8.1
RUNNING CURRENT	A		3.3			4.7			6			6.6			9.7	
INPUT POWER	W	190	700	1000	170	3010	3350	210	1260	1650	280	1470	2030	380	2120	2700
EER	W/W	4.74	3.57	3	5.29	3.47	3.25	4.79	3.33	2.78	3.5	3.4	2.96	2.58	3.21	3
	BTU/Hw	16.16	12.18	10.23	18.06	11.82	11.08	16.23	11.37	9.51	11.93	11.63	10.1	8.79	10.94	10.22
CAPACITY	Kw	0.9	3.3	4.1	0.9	4.25	5.1	0.9	5	6.8	0.98	5.8	8	0.98	8.6	9.9
	BTU/Hr	3070	11250	13980	3070	14490	17390	3070	17060	23200	3340	19800	27300	3340	29300	33800
RUNNING CURRENT	A		3.8			5.2			6.3			6.9			12.1	
INPUT POWER	W	170	820	1150	150	1120	1460	210	1385	2280	340	1540	2600	450	2660	3200
COP	W/W	5.29	4.02	3.57	6	3.79	3.49	4.28	3.6	2.98	2.88	3.77	3.08	2.18	3.23	3.09
	BTU/Hw	18.06	13.71	12.16	2047	12.94	11.91	14.61	12.31	10.17	9.82	12.86	10.5	7.42	11.02	10.56

## PRODUCT SPECIFICATION

### SUPER TROPICAL - INVERTER

Model		Indoor	CS-K18NKF						CS-K24NKF					
		Outdoor	CU-K18NKF						CU-K24NKF					
Performance Test Condition			ISO 5151						ISO 5151					
Power Supply		Phase, Hz	Single, 50						Single, 50					
		V	220			240			220			240		
			Min.	Mid.	Max.	Min.	Mid.	Max.	Min.	Mid.	Max.	Min.	Mid.	Max.
Cooling	Capacity	kW	1.00	5.50	6.50	1.00	5.50	6.50	2.10	7.03	8.00	2.10	7.03	8.00
		BTU/h	3410	18800	22200	3410	18800	22200	7160	24000	27300	7160	24000	27300
		kJ/h	3600	19800	23400	3600	19800	23400	7560	25310	28800	7560	25310	28800
	Running Current	A	-	8.3	-	-	7.5	-	-	11.6	-	-	10.6	-
	Input Power	W	240	1.71k	2.10k	240	1.71k	2.10k	400	2.26k	2.90k	400	2.26k	2.90k
	EER	W/W	4.17	3.22	3.10	4.17	3.22	3.10	5.25	3.11	2.76	5.25	3.11	2.76
		BTU/hW	14.21	10.99	10.57	14.21	10.99	10.57	17.90	10.62	9.41	17.90	10.62	9.41
		kJ/hW	15.00	11.58	11.14	15.00	11.58	11.14	18.90	11.20	9.93	18.90	11.20	9.93
	Power Factor	%	-	94	-	-	95	-	-	89	-	-	89	-
	Indoor Noise (H / L / QLo)	dB-A	44 / 36 / 33			44 / 36 / 33			48 / 38 / 35			48 / 38 / 35		
Outdoor Noise (H / L / QLo)	dB-A	48 / - / -			49 / - / -			53 / - / -			54 / - / -			
Max Current (A) / Max Input Power (W)			10.6 / 2.40k						14.3 / 3.10k					
Starting Current (A)			8.3						11.6					



## PIPING SPECIFICATION

### STANDARD COOLING & HEAT PUMP-INVERTER

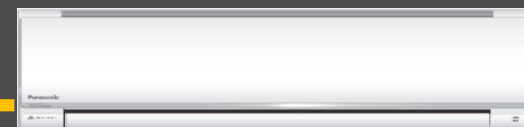
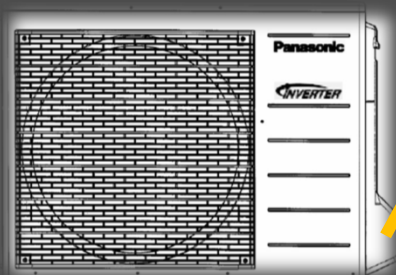
### CU/CS-RE/9/12/15/18/24NKE

Piping specification and additional gas amount

Model	Piping Size		Rated length (m)	Max Elevation (m)	Min Piping Length	Max piping Length	Add refrigerant (g/m)	Piping length for add
	Gas mm (Inch)	Liq mm (Inch)						
RE9NKE, UE9***	9.52 (3/8")	6.35 (1/4")	5	5	3	15	20	7.5
RE12NKE, UE12***	9.52 (3/8")	6.35 (1/4")	5	5	3	15	20	7.5
RE15NKE	12.7 (1/2")	6.35 (1/4")	5	5	3	15	20	7.5
RE18NKE, UE18***	12.7 (1/2")	6.35 (1/4")	5	15	3	20	20	7.5
RE24NKE	15.8 (5/8")	6.35 (1/4")	5	20	3	30	30	10

Example for RE9NKE :

If the unit is installed at 10 meters distance, the quantity of additional gas should be  $50\text{gm} (10-7.5)\text{m} \times 20\text{gm/m} = 50\text{gm}$



## PIPING SPECIFICATION

### SUPER TROPICAL - INVERTER

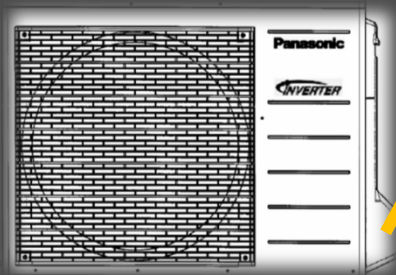
### CU/CS-K18/24NKF

Piping specification and additional gas amount

Model	Piping Size		Rated length (m)	Max Elevation (m)	Min Piping Length	Max piping Length	Add refrigerant (g/m)	Piping length for add
	Gas mm (Inch)	Liq mm (Inch)						
K18NKF	12.7 (1/2")	6.35 (1/4")	5	15	3	20	20	7.5
K24NKF	15.88 (5/8")	6.35 (1/4")	5	20	3	30	30	7.5

Example for K24NKF :

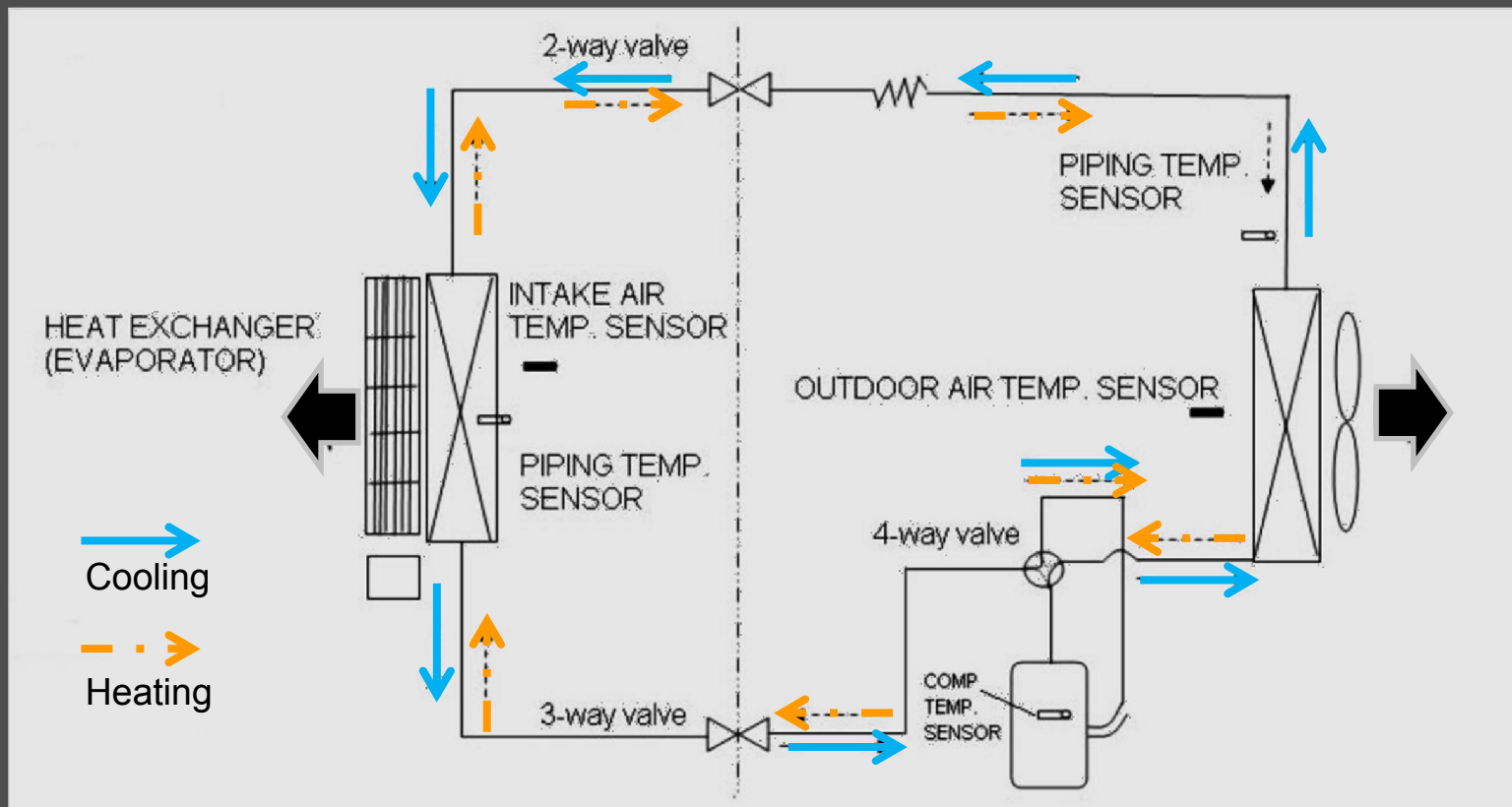
If the unit is installed at 15 meters distance, the quantity of additional gas should be  $(15-7.5)\text{m} \times 30\text{gm/m} = 225\text{gm}$



# **REFRIGERATION CYCLE**

## REFRIGERATION CYCLE

CU/CS-RE/9/12/15NKE



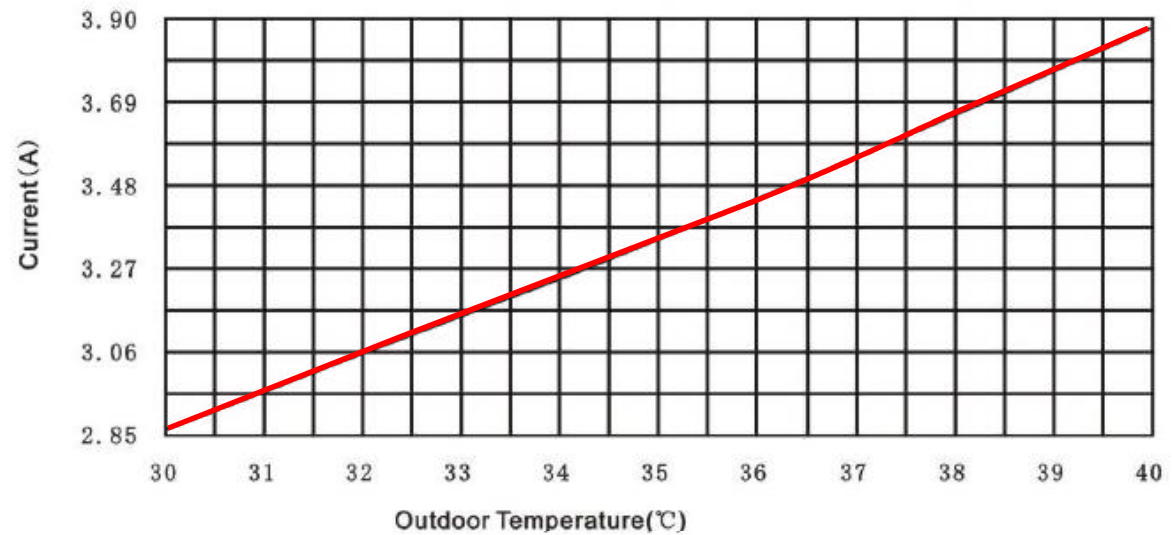
### Sensor's function:

- 1- Compressor temp sensor - ( Compressor overheating protection )
- 2- Outdoor pipe sensor- Overload protection for cooling and heating.
- 3- Outdoor air sensor – Compressor Hz control, Low pressure protection parameter, dew prevention control parameter
- 3- Indoor pipe sensor – Freezing prevention, Indoor fan control in heating, overload protection in heating, Indoor fan control when eva in low temp, low pressure protection in cooling and heating,
- 4- Indoor air sensor – Dew prevention control parameter, Low pressure parameter,

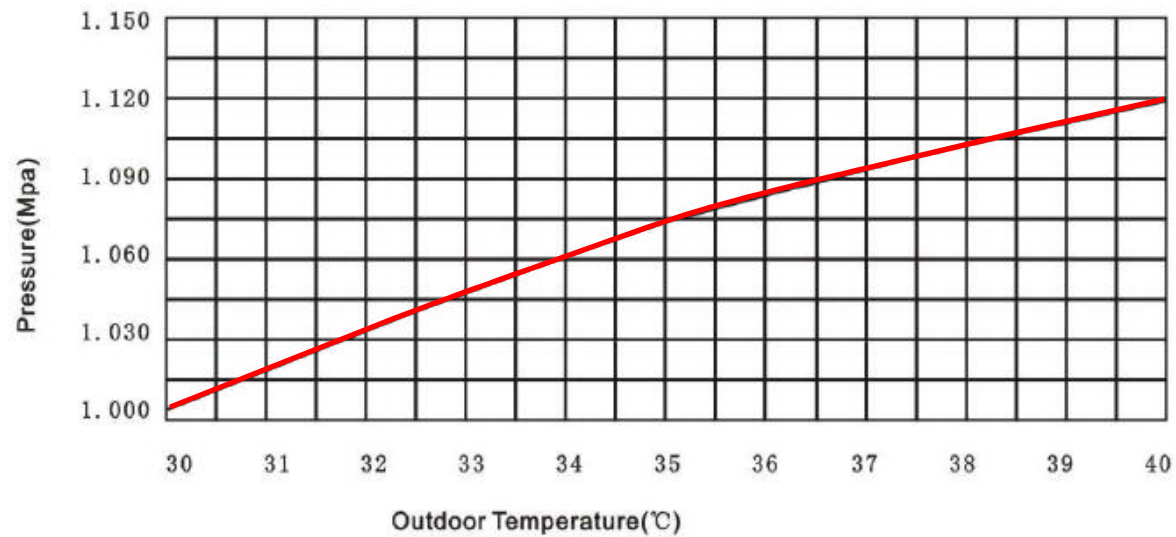
## COOLING CHARACTERISTIC

CU/CS-RE9NKE

CURRENT (A)



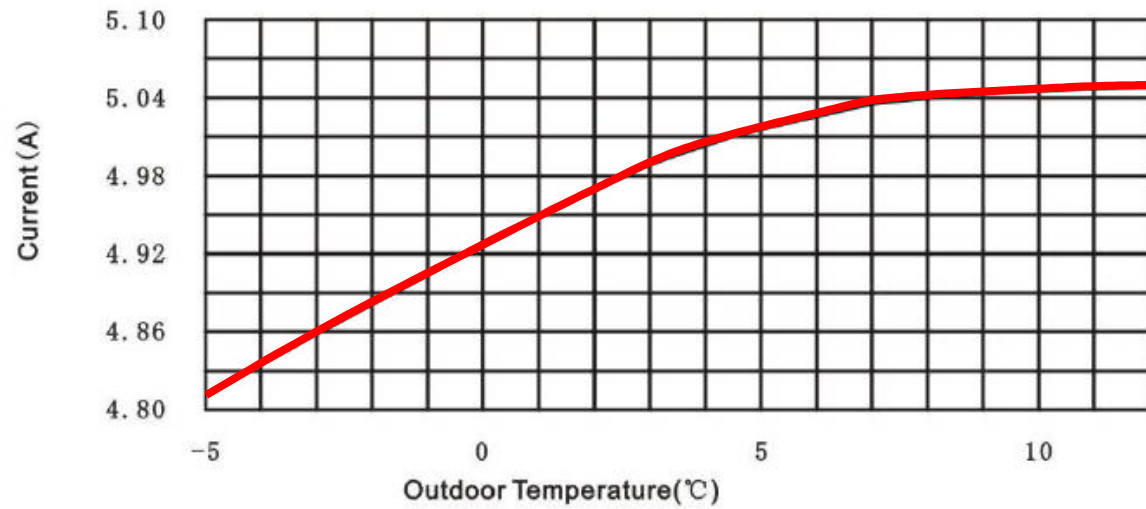
PRESSURE (Mpa)



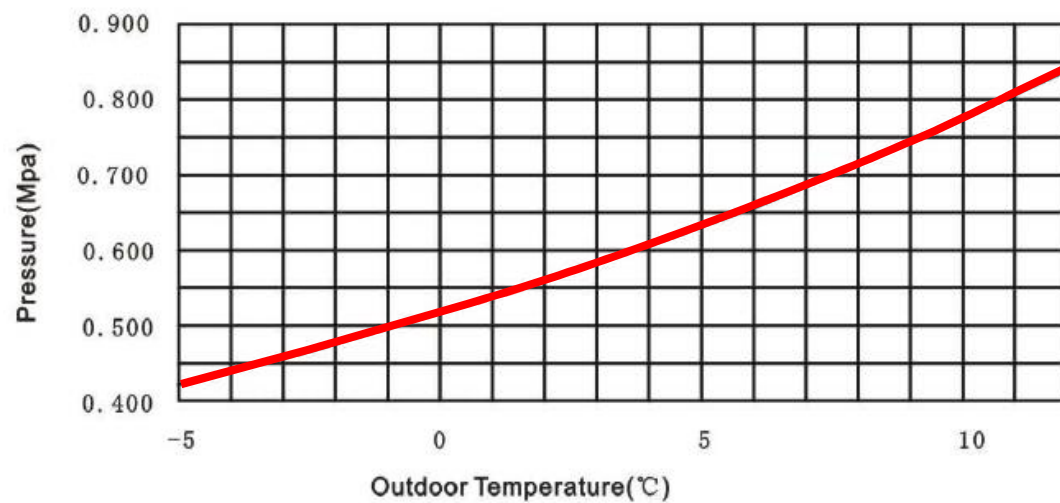
## HEATING CHARACTERISTIC

**CU/CS-RE9NKE**

**CURRENT (A)**



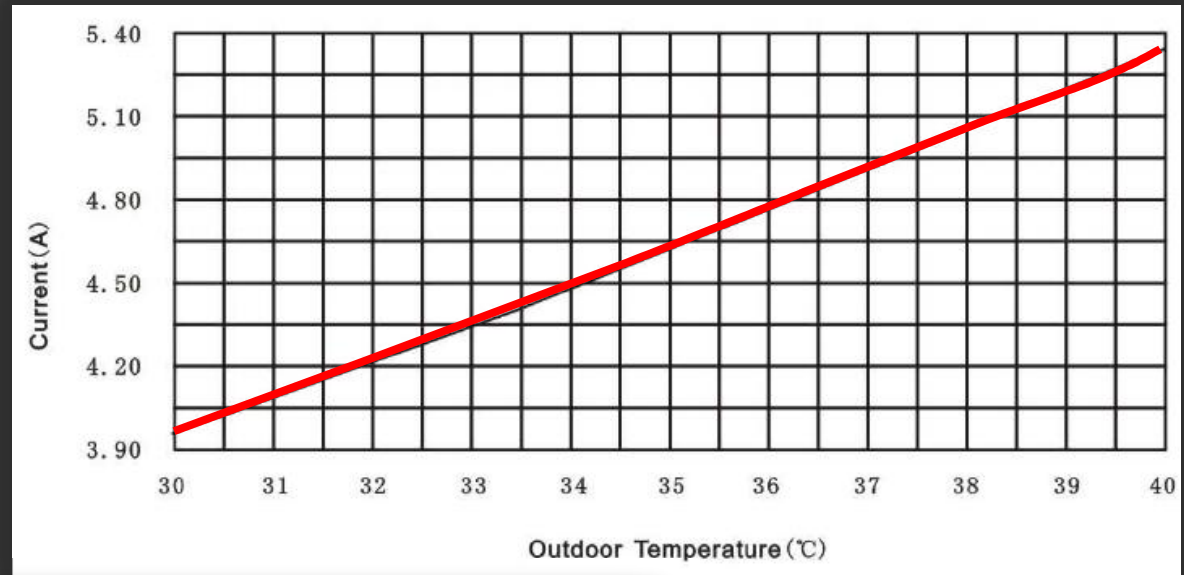
**PRESSURE (Mpa)**



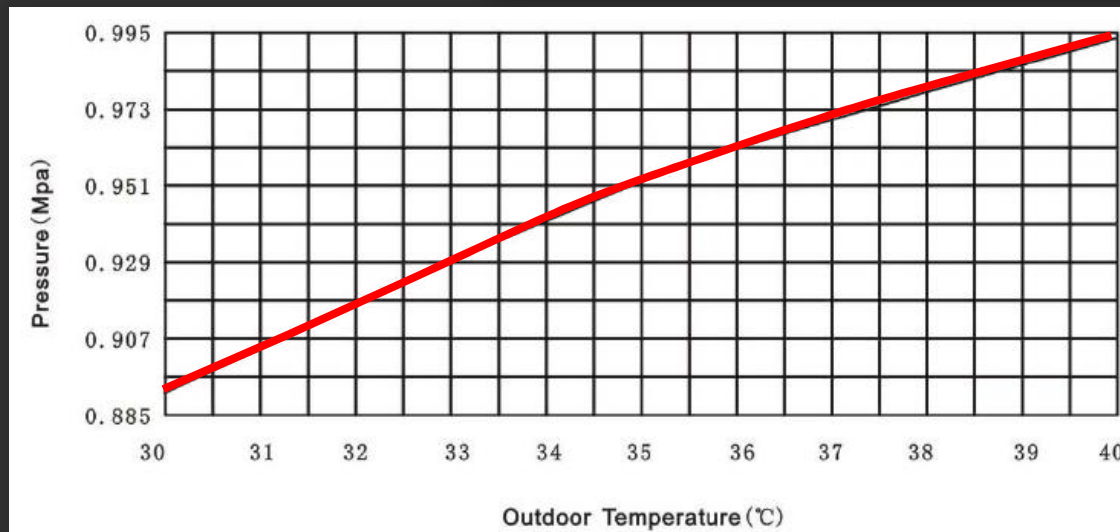
## COOLING CHARACTERISTIC

CU/CS-RE12NKE

CURRENT (A)



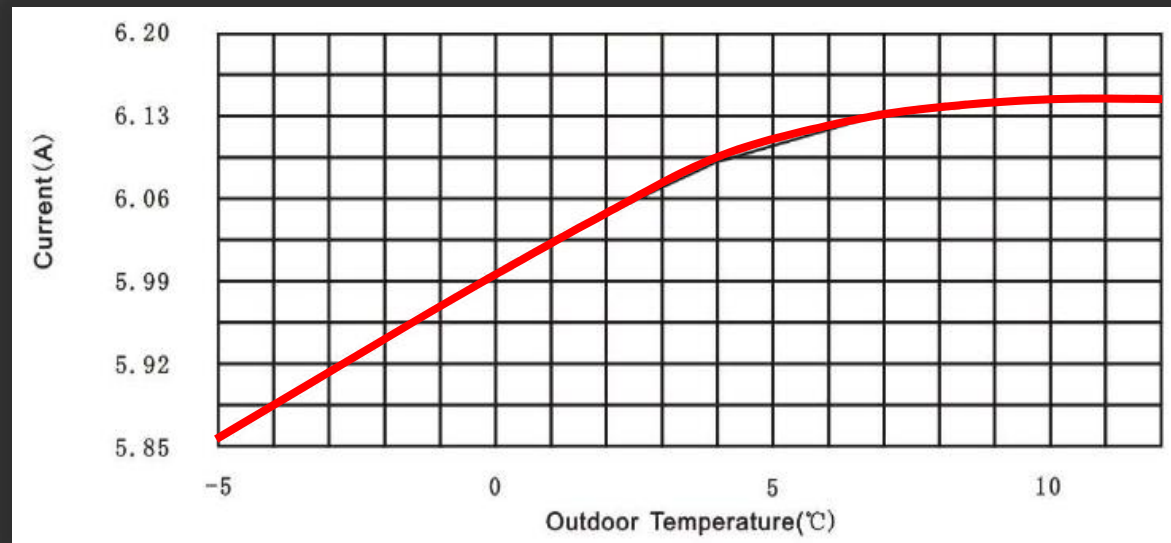
PRESSURE (Mpa)



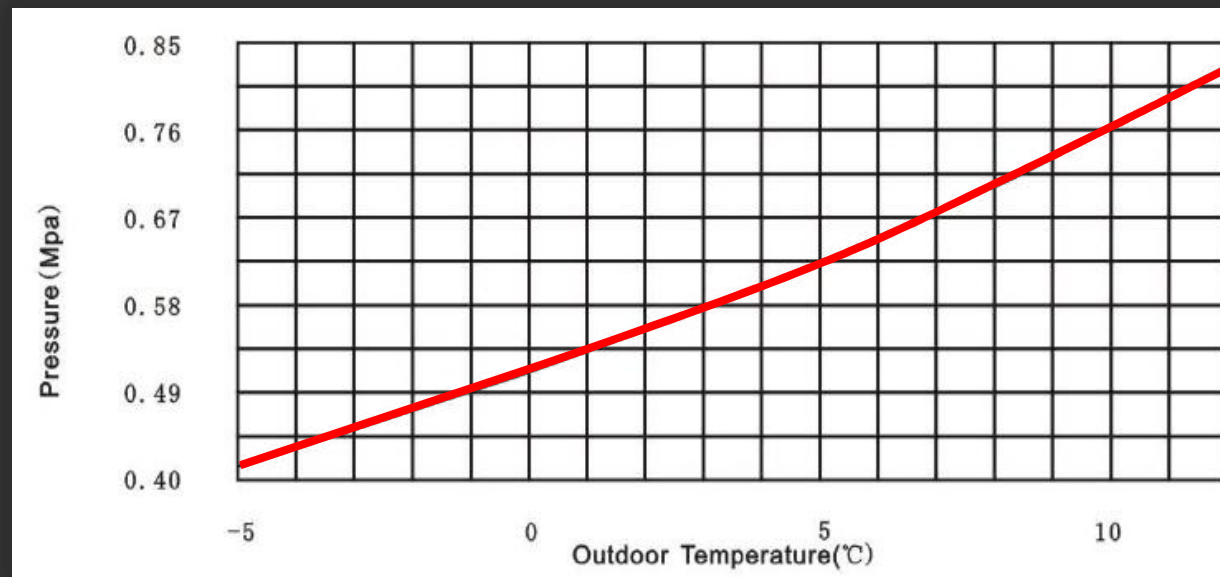
## HEATING CHARACTERISTIC

CU/CS-RE12NKE

CURRENT (A)



PRESSURE (Mpa)

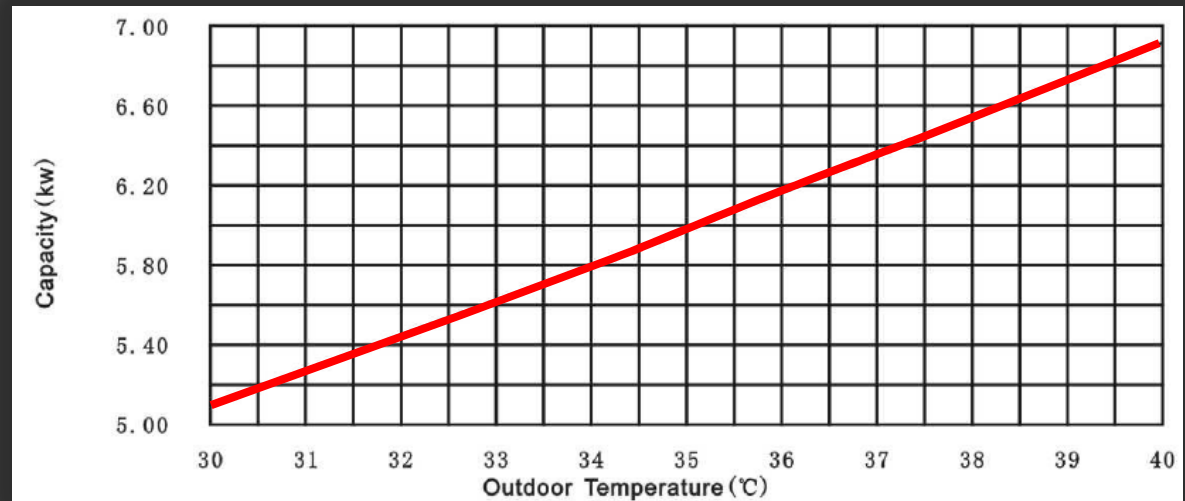




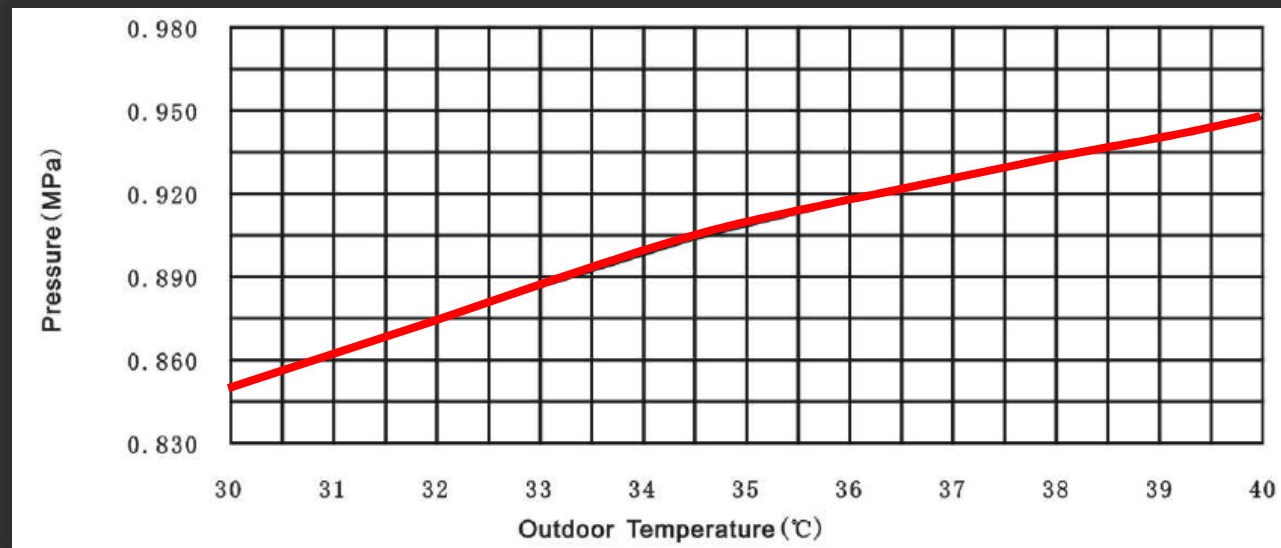
## COOLING CHARACTERISTIC

CU/CS-RE15NKE

CURRENT (A)



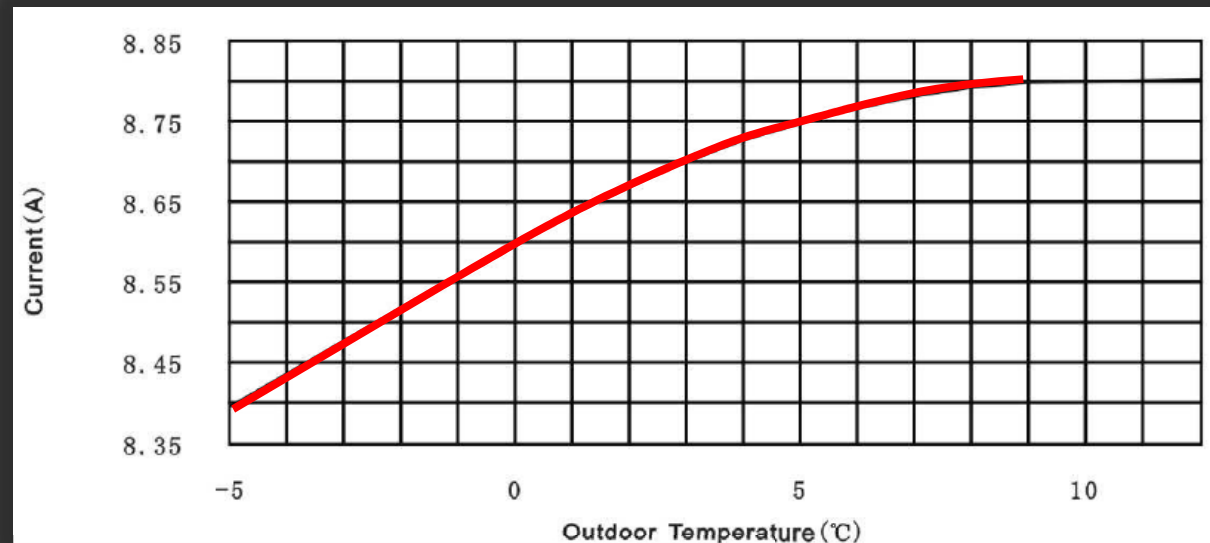
PRESSURE (Mpa)



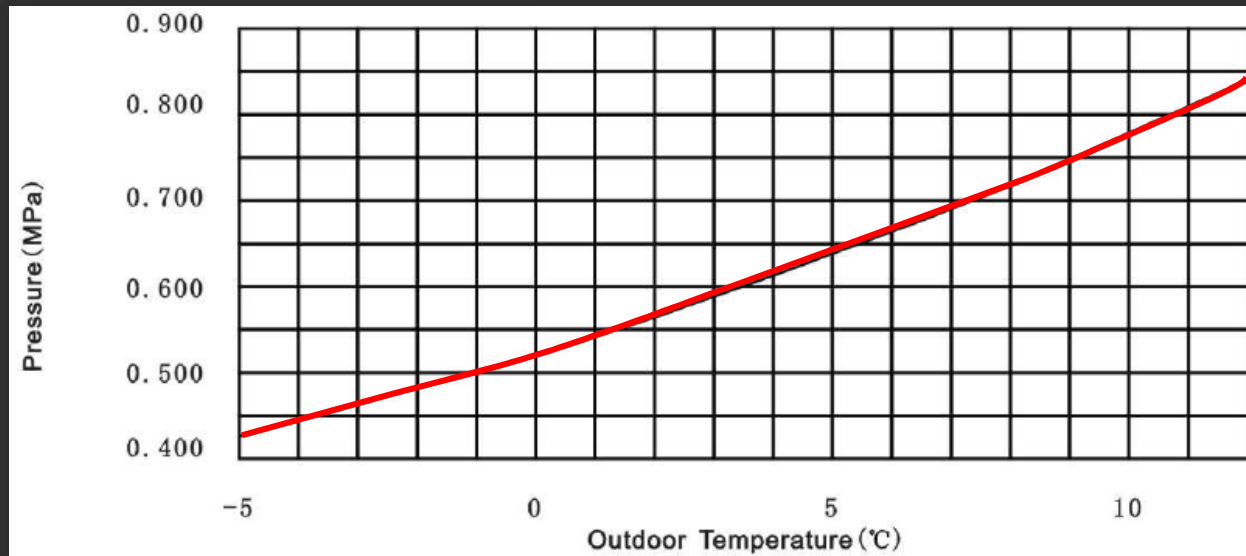
## HEATING CHARACTERISTIC

**CU/CS-RE15NKE**

**CURRENT (A)**



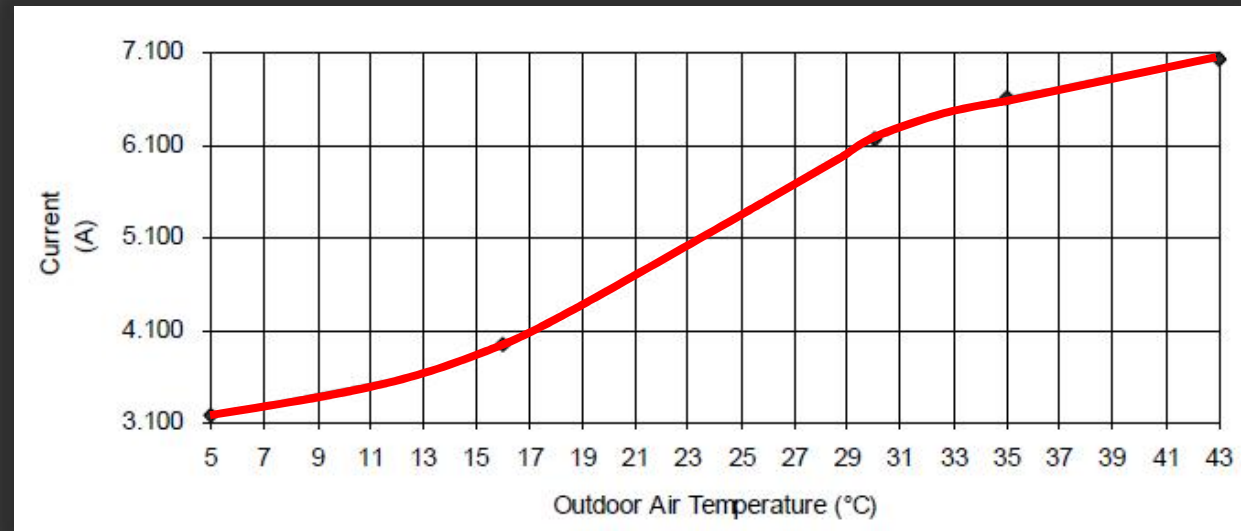
**PRESSURE (Mpa)**



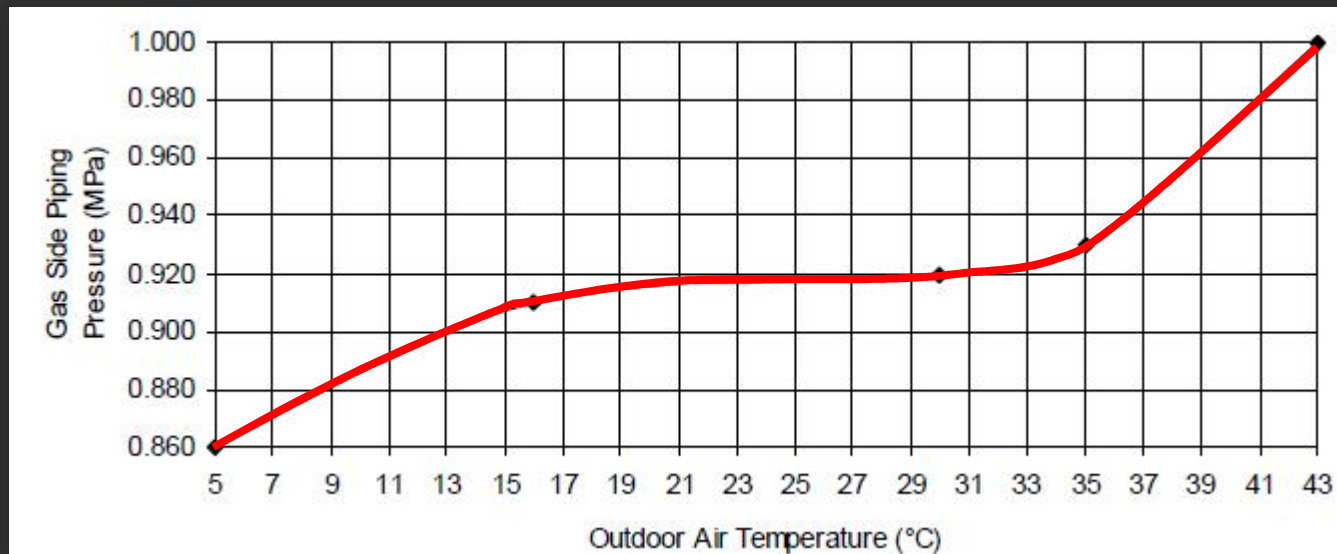
## COOLING CHARACTERISTIC

CU/CS-RE18NKE

CURRENT (A)



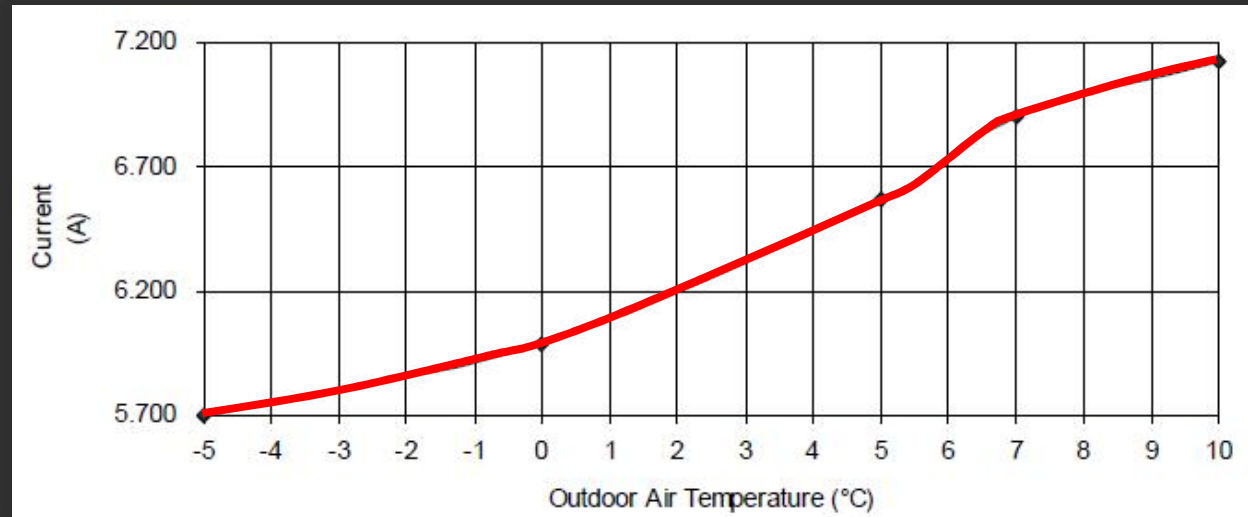
PRESSURE (Mpa)



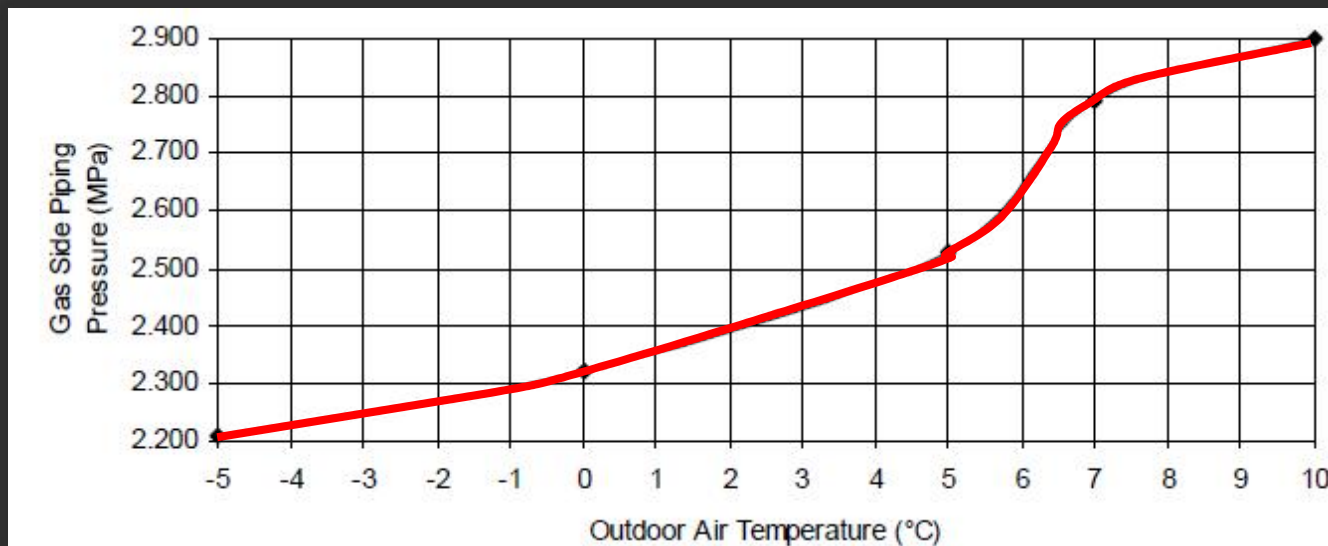
## HEATING CHARACTERISTIC

**CU/CS-RE18NKE**

**CURRENT (A)**



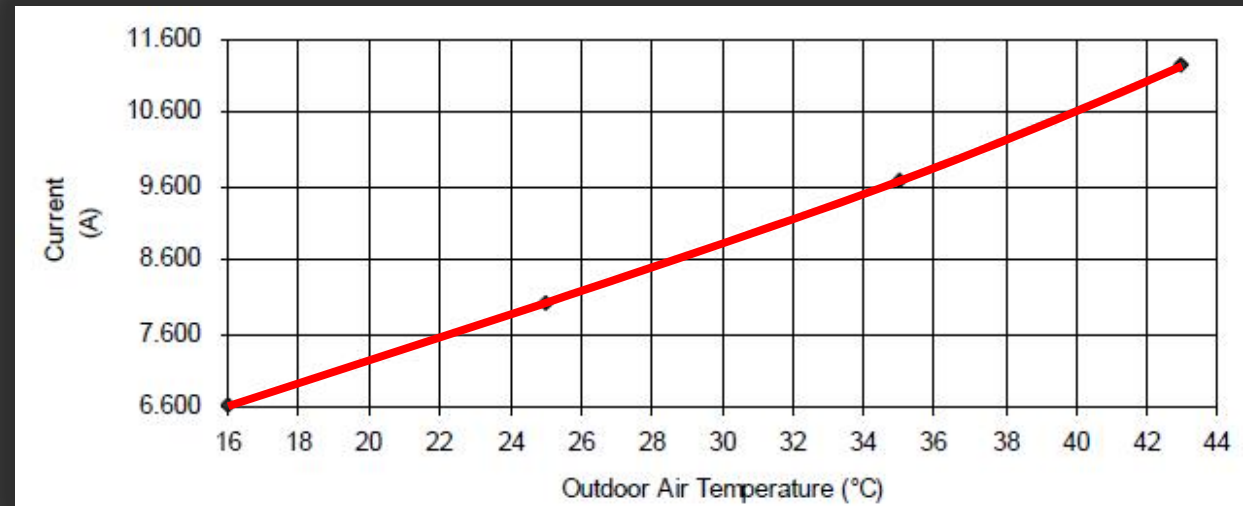
**PRESSURE (Mpa)**



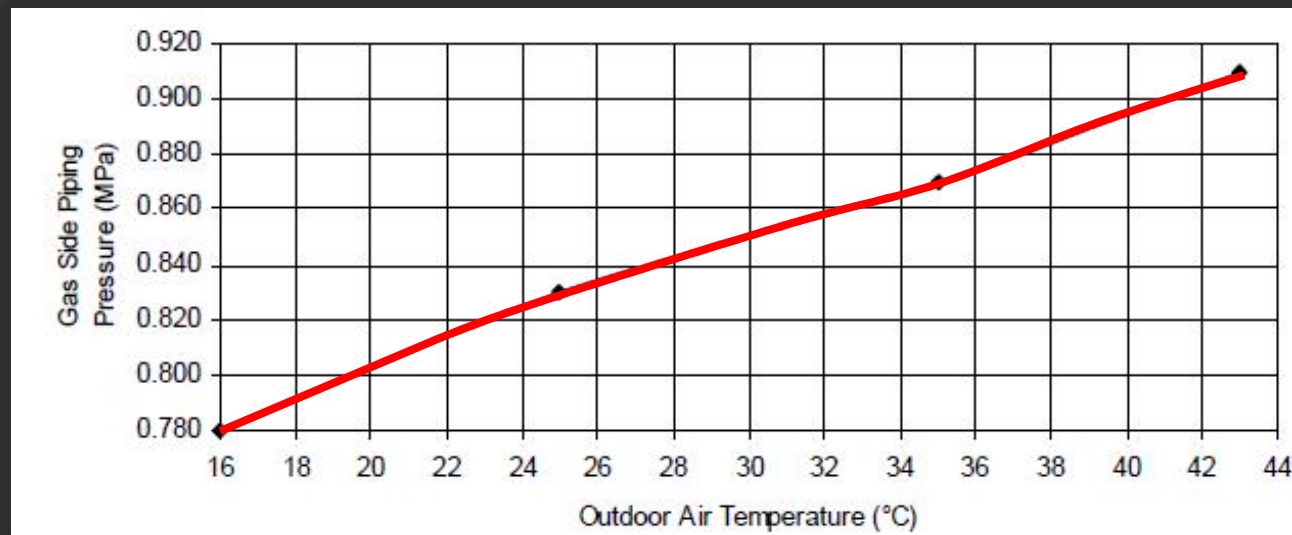
## COOLING CHARACTERISTIC

CU/CS-RE24NKE

CURRENT (A)



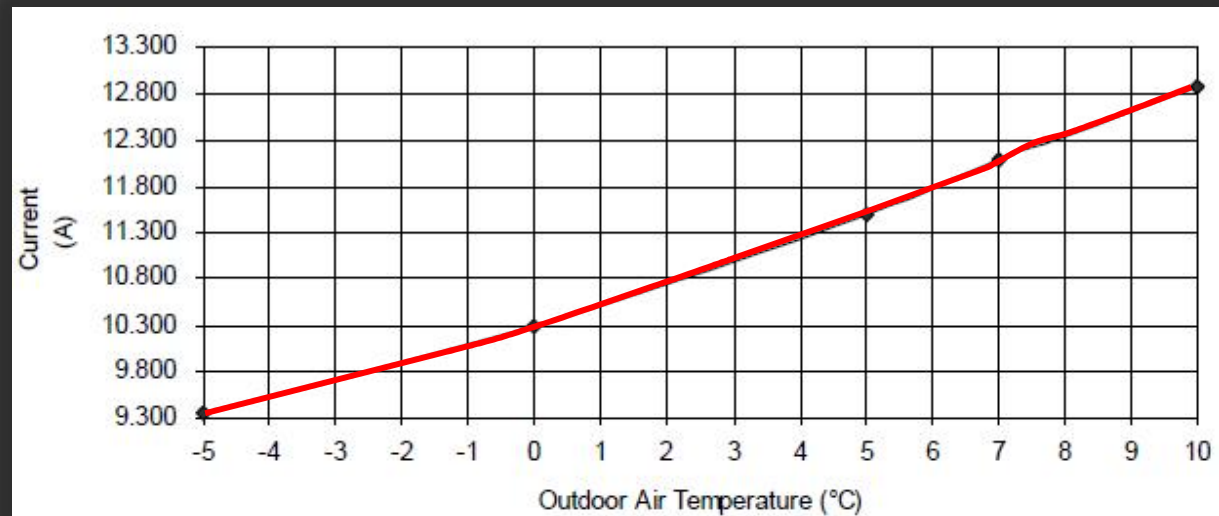
PRESSURE (Mpa)



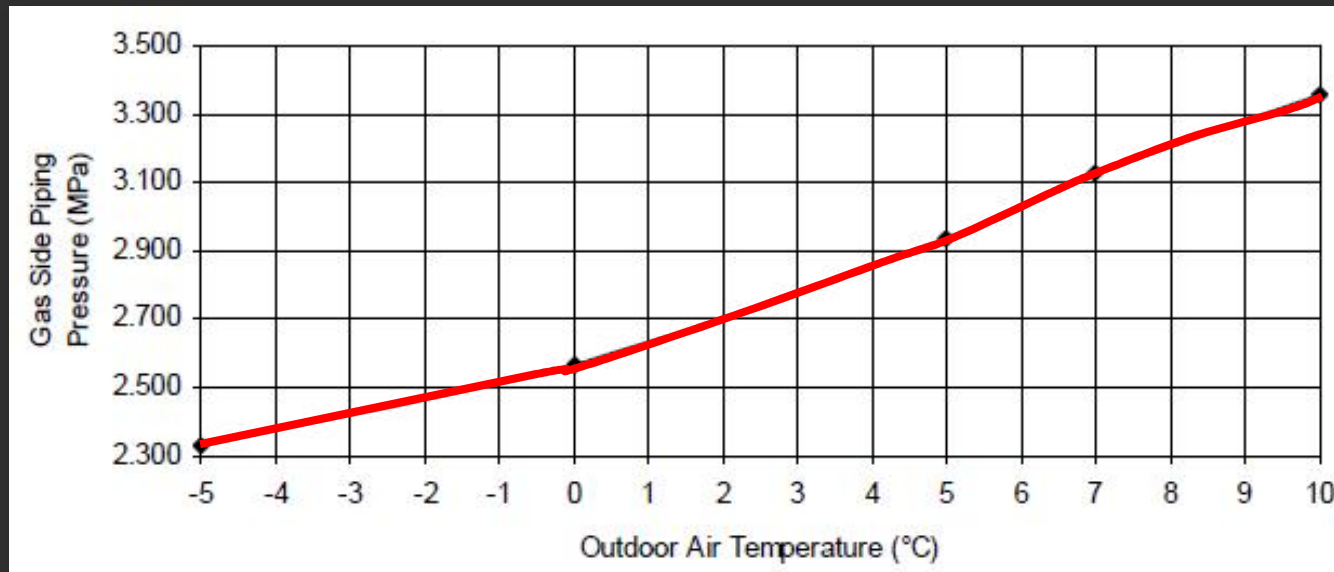
## HEATING CHARACTERISTIC

**CU/CS-RE 24NKE**

**CURRENT (A)**



**PRESSURE (Mpa)**

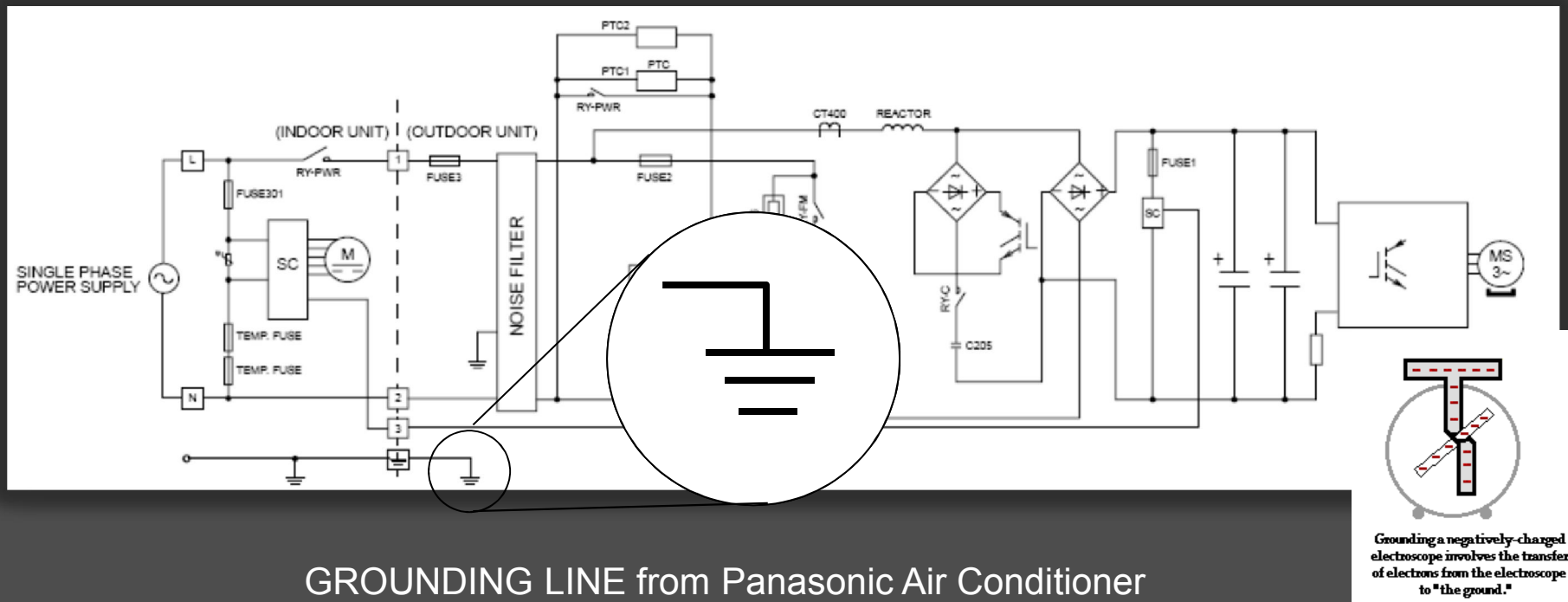


# **BLOCK DIAGRAM & WIRING DIAGRAM**

## GROUNDING LINE

### Power Supply Connection – Grounding

A safety measure that prevent people from accidentally contact with electrical hazards.



GROUNDING LINE from Panasonic Air Conditioner

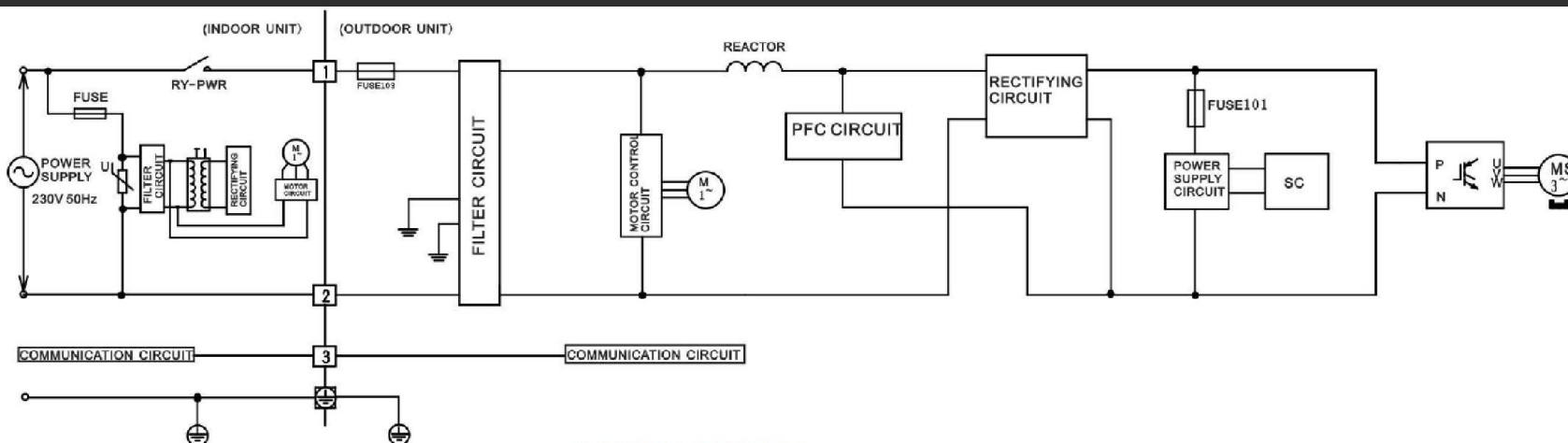
#### How it works

1. Ground serves as a seemingly infinite reservoir of electrons.
2. Remove the excess charge by transferring electrons and to neutralize that object.

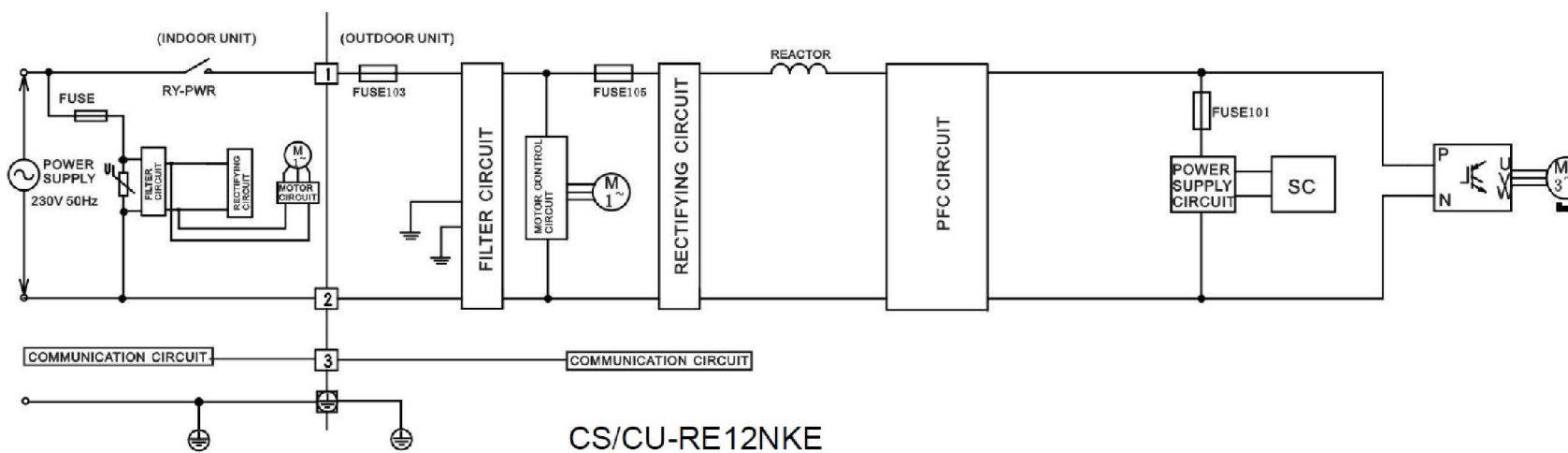


## BLOCK DIAGRAM

### CU/CS-RE9/12NKE



CS/CU-RE9NKE

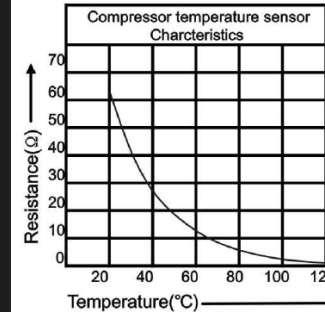
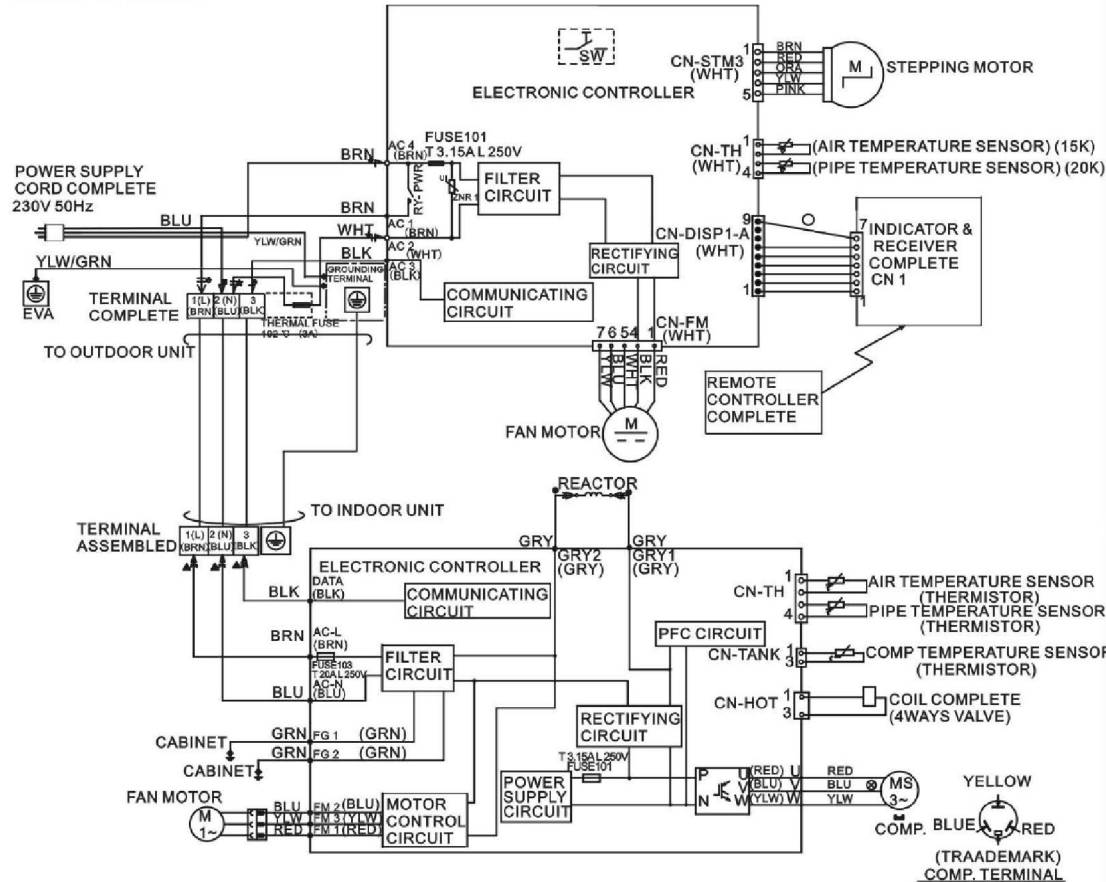


CS/CU-RE12NKE

# WIRING DIAGRAM

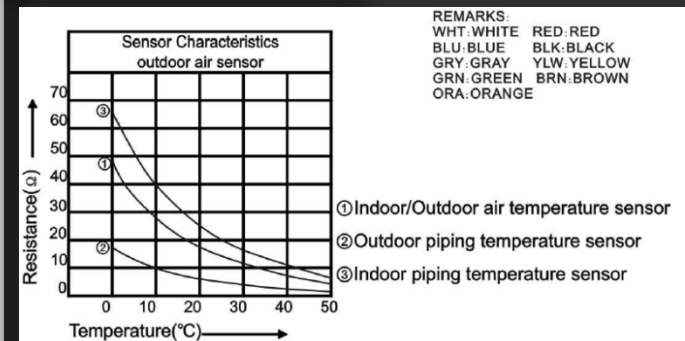
## CU/CS-RE9NKE

CS/CU-RE9NKE



Resistance of Compressor Windings

CWB092606	
MODEL	CU-RE9NKE
RESISTANCE(Ω)	
U-V	3.034
U-W	3.021
V-W	3.009

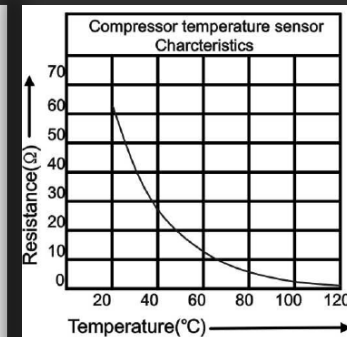
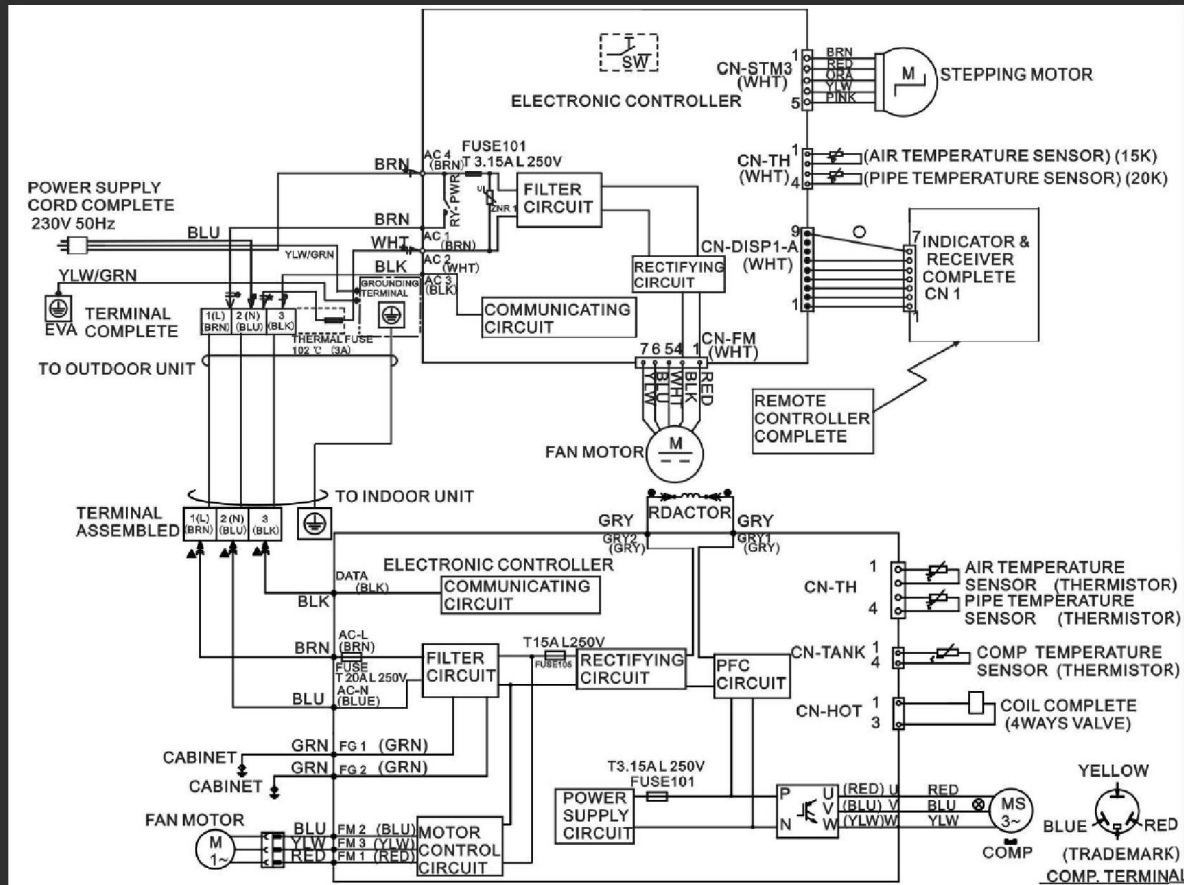


Resistance of Fan Motor Windings

CWA951842	
MODEL	CU-RE9NKE
RESISTANCE(Ω)	
M(Y-B)	389.7
A(Y-R)	389.9

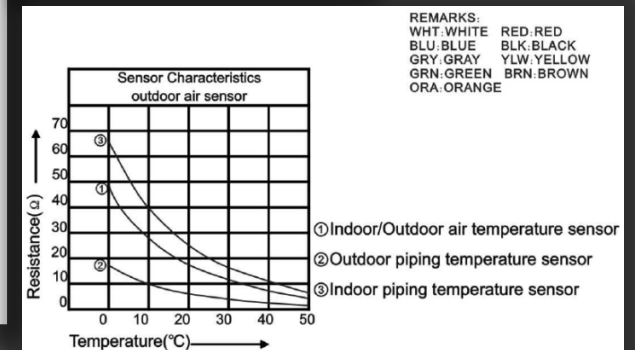
# WIRING DIAGRAM

## CU/CS-RE12NKE



Resistance of Compressor Windings

CWB092605	
MODEL	CU-RE12NKE
RESISTANCE(Ω)	
U-V	1.152
U-W	1.152
V-W	1.152

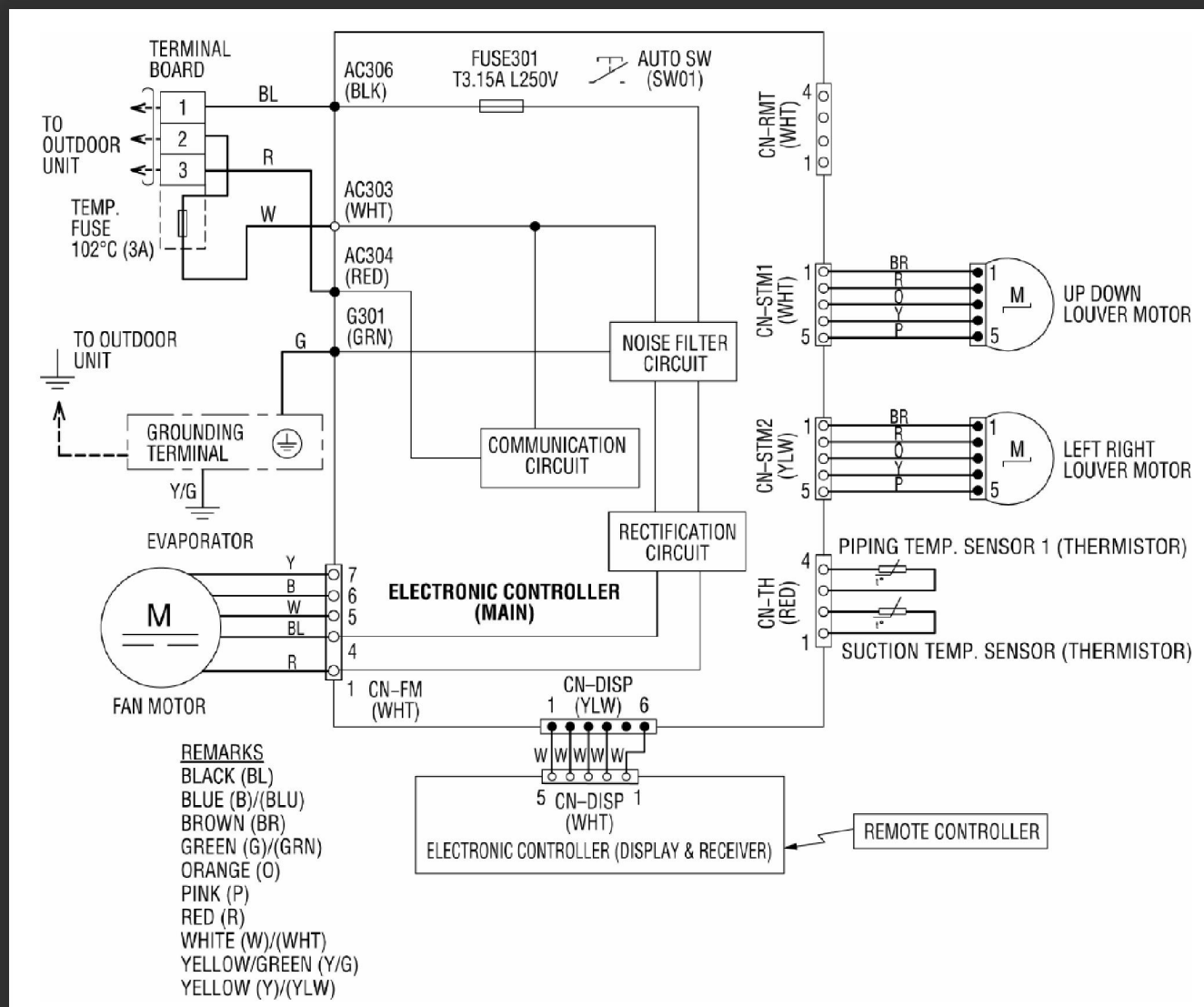


Resistance of Fan Motor Windings

CWA951766	
MODEL	CU-RE12NKE
RESISTANCE(Ω)	
M(Y-B)	237
A(Y-R)	197

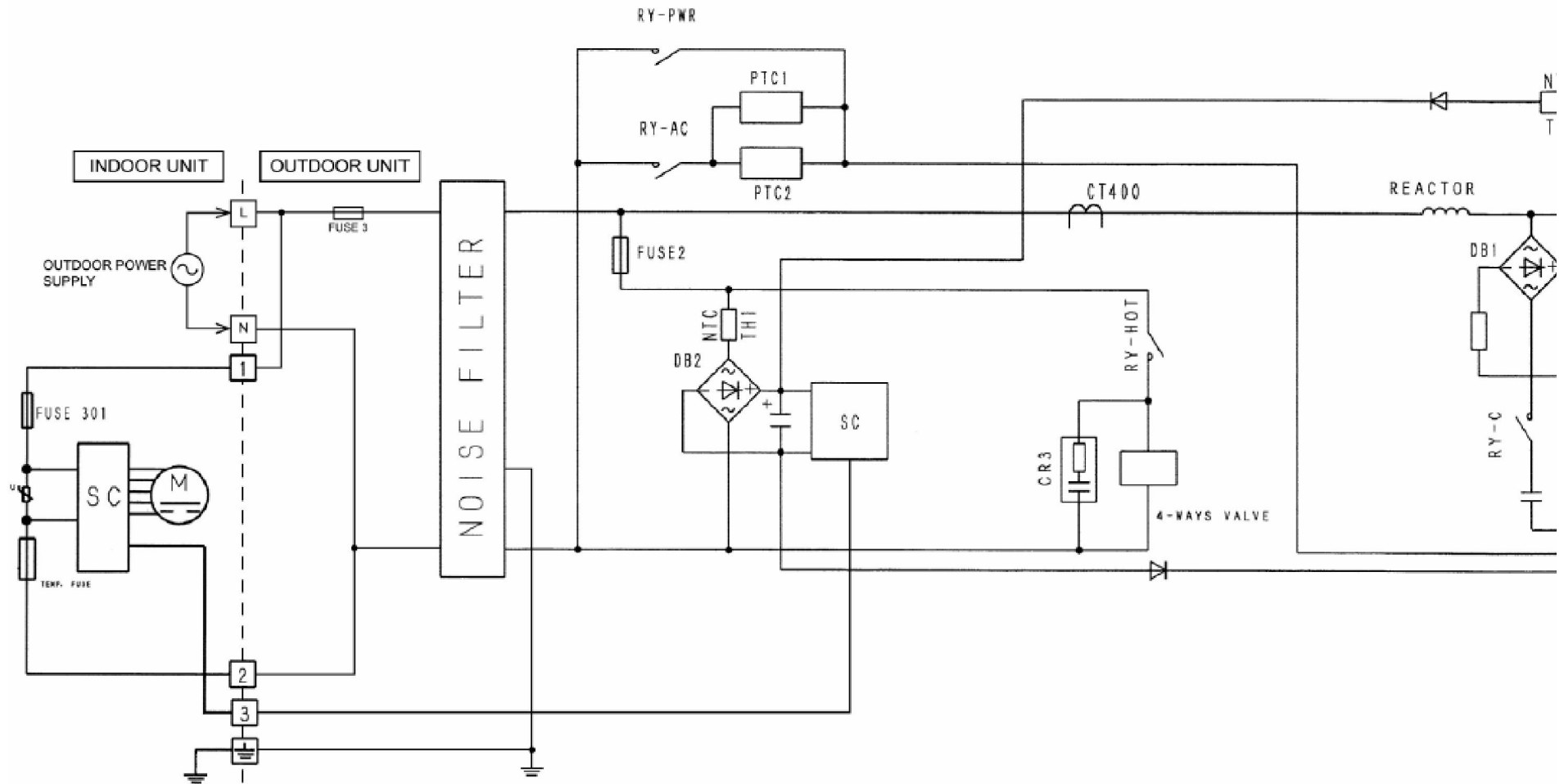
# WIRING DIAGRAM

## CS-RE18/24NKE



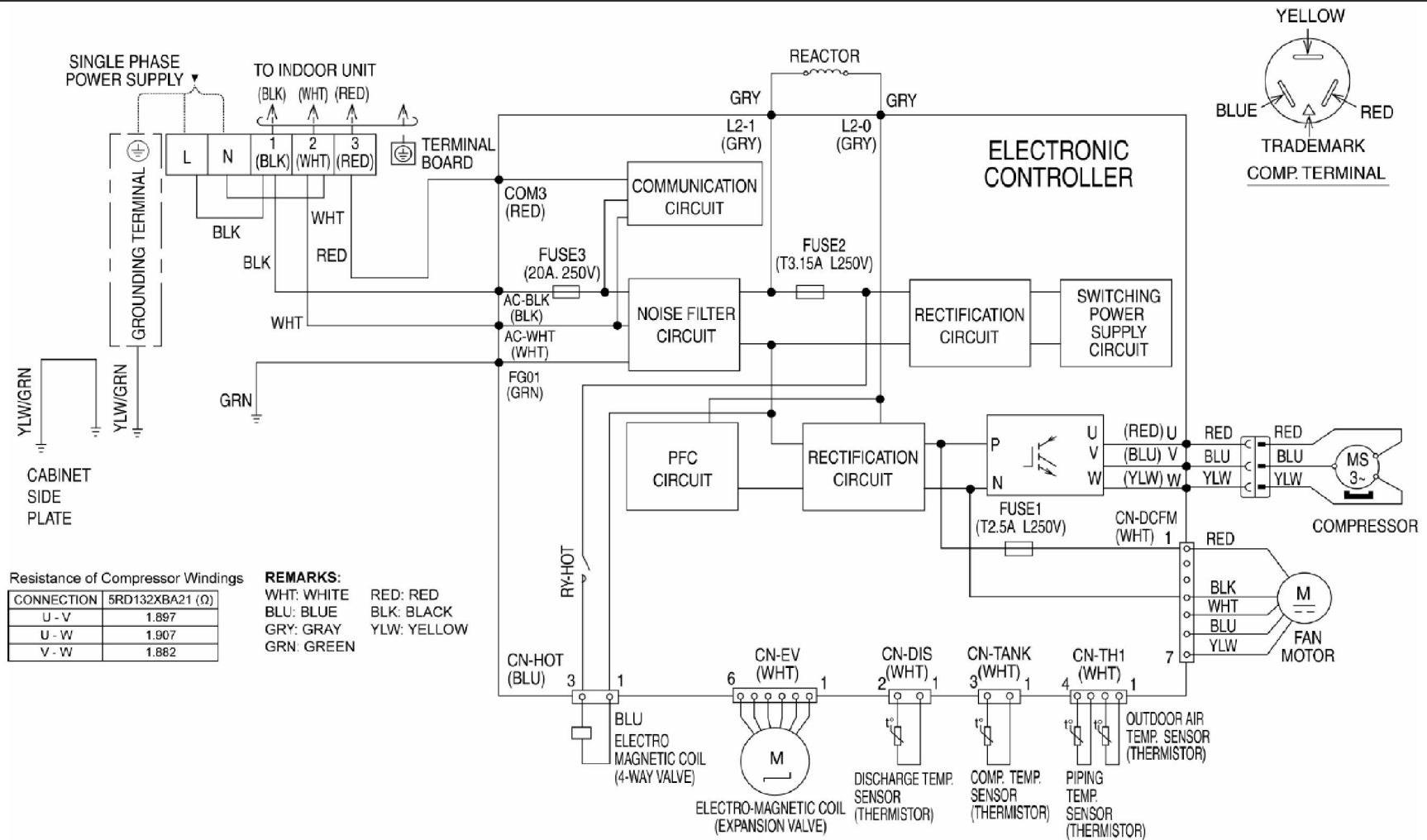
## BLOCK DIAGRAM

### CU/CS-RE18NKE



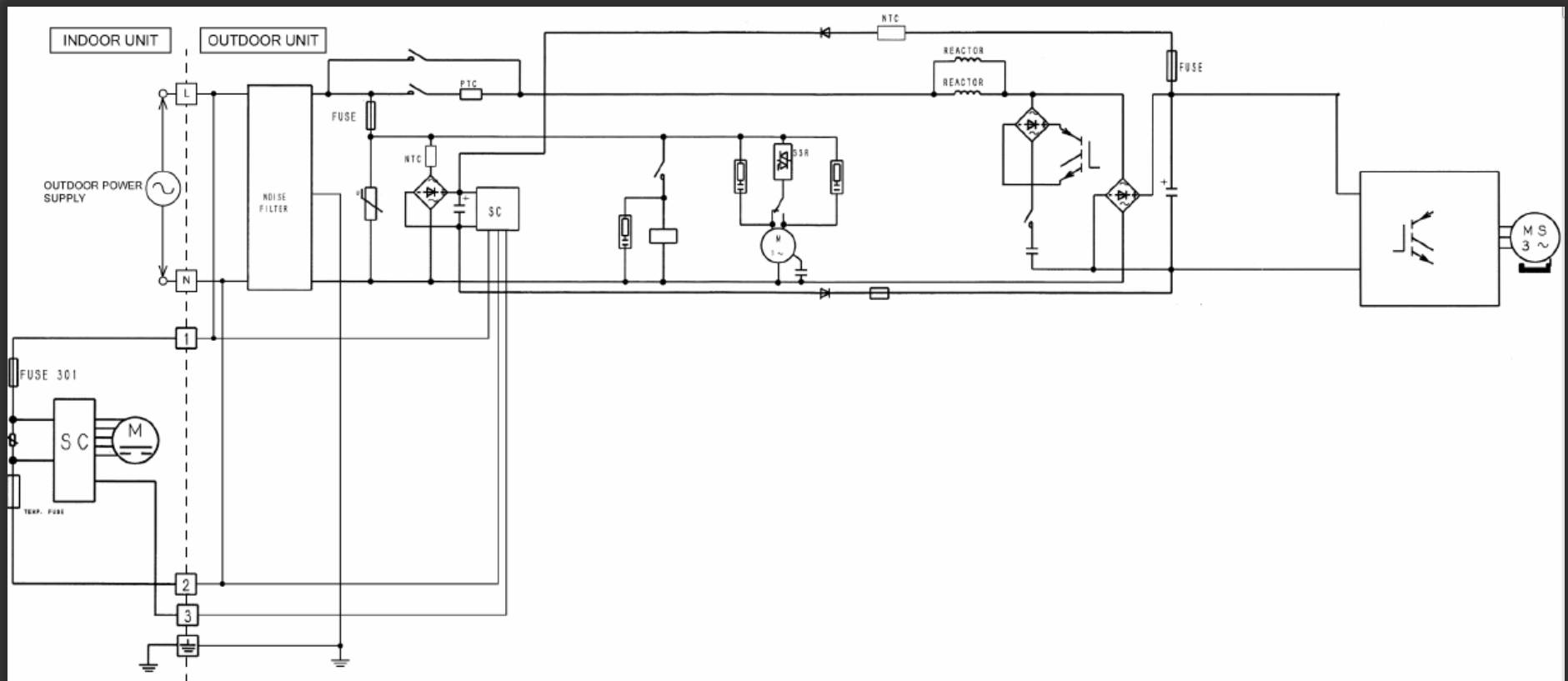
# WIRING DIAGRAM

## CU-RE18NKE



## BLOCK DIAGRAM

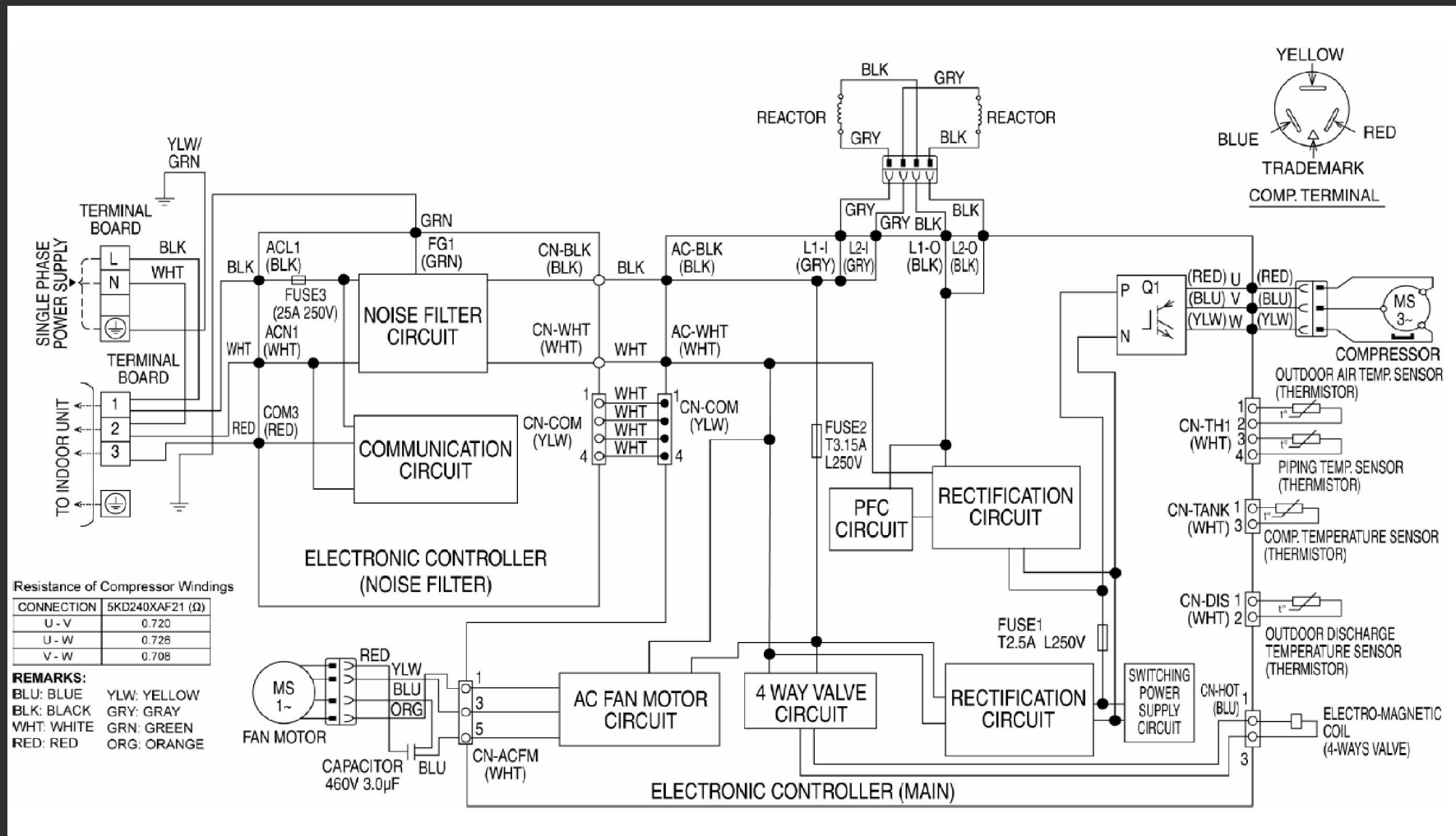
### CU/CS-RE24NKE





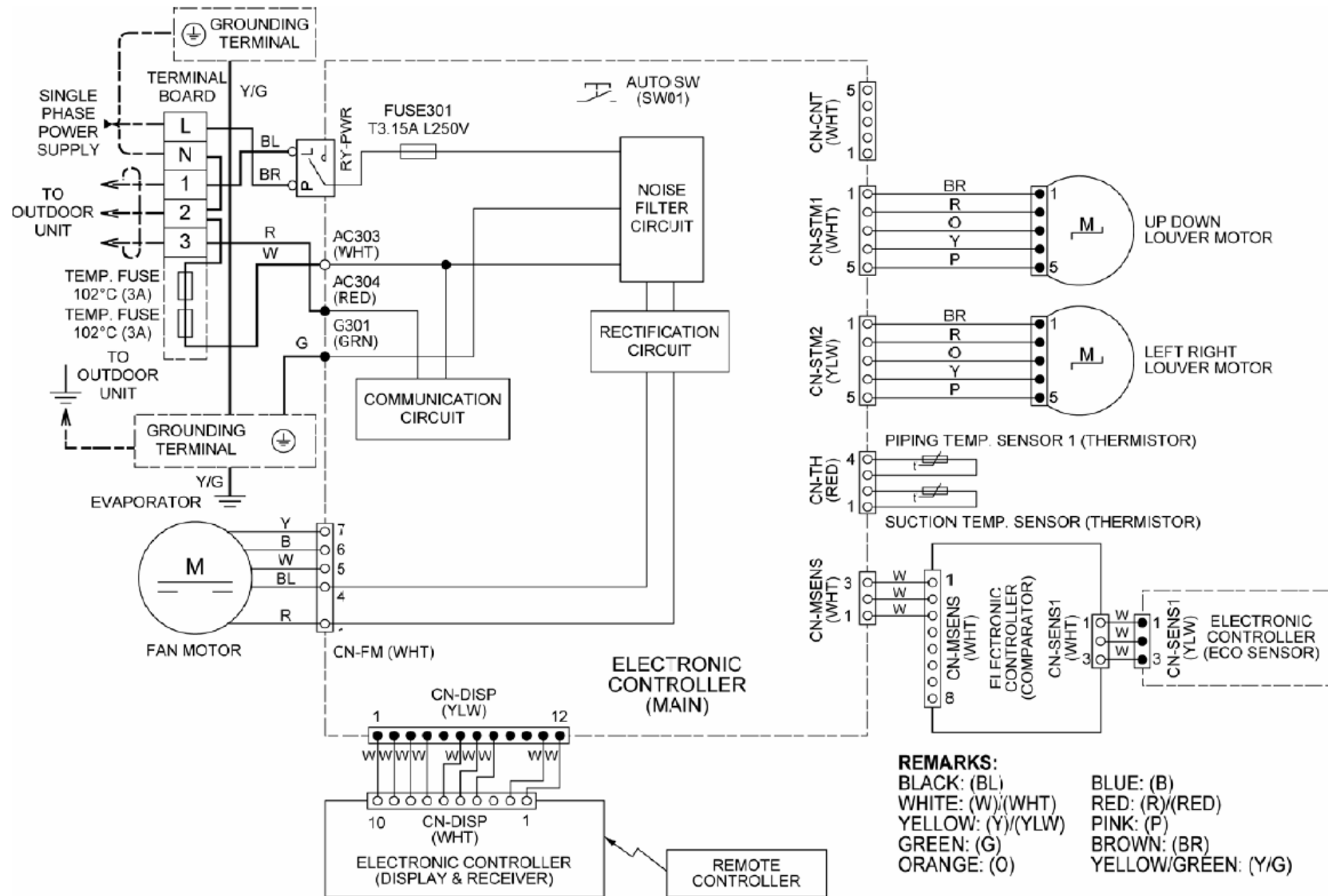
# WIRING DIAGRAM

## CU-RE24NKE

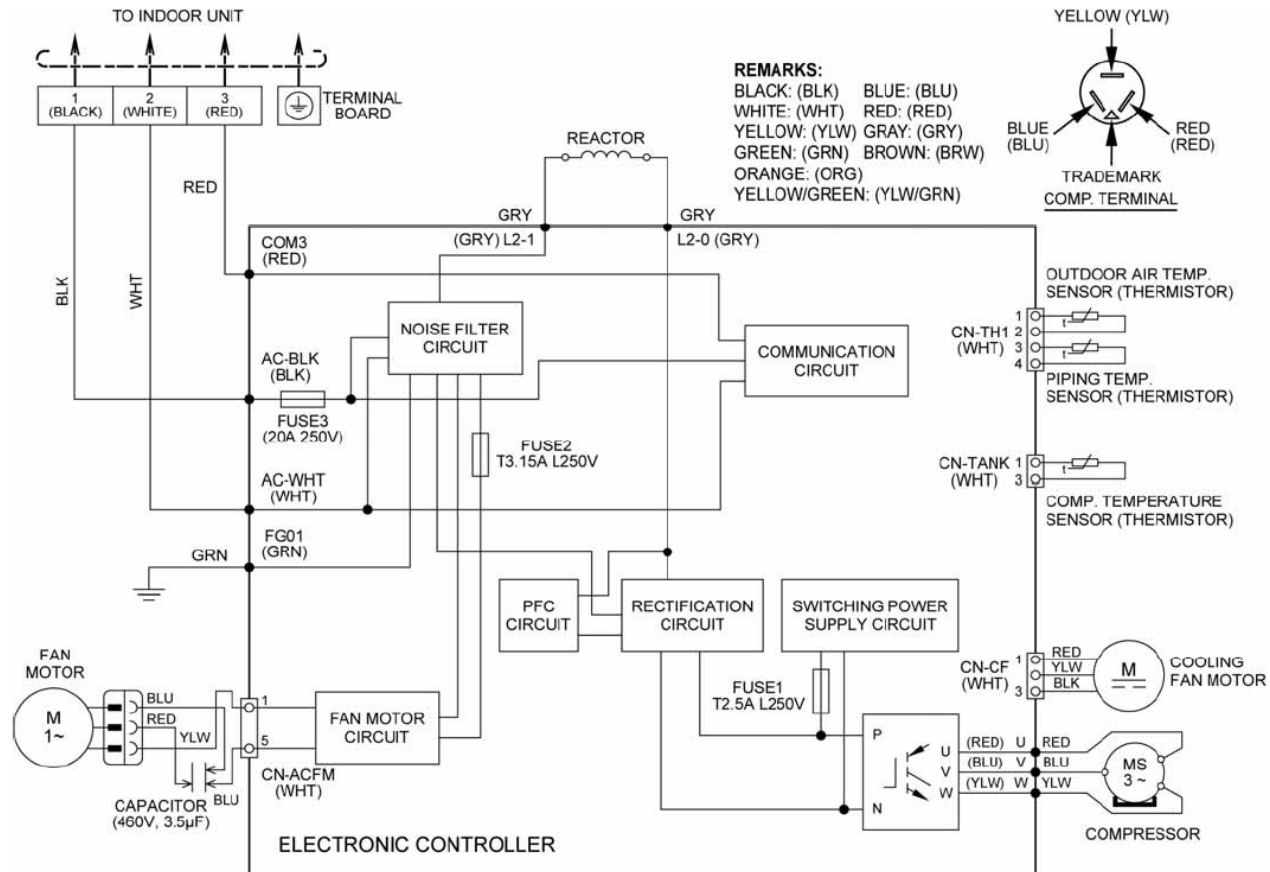




# CS-K18/24NKF



# CU-K18/24NKF



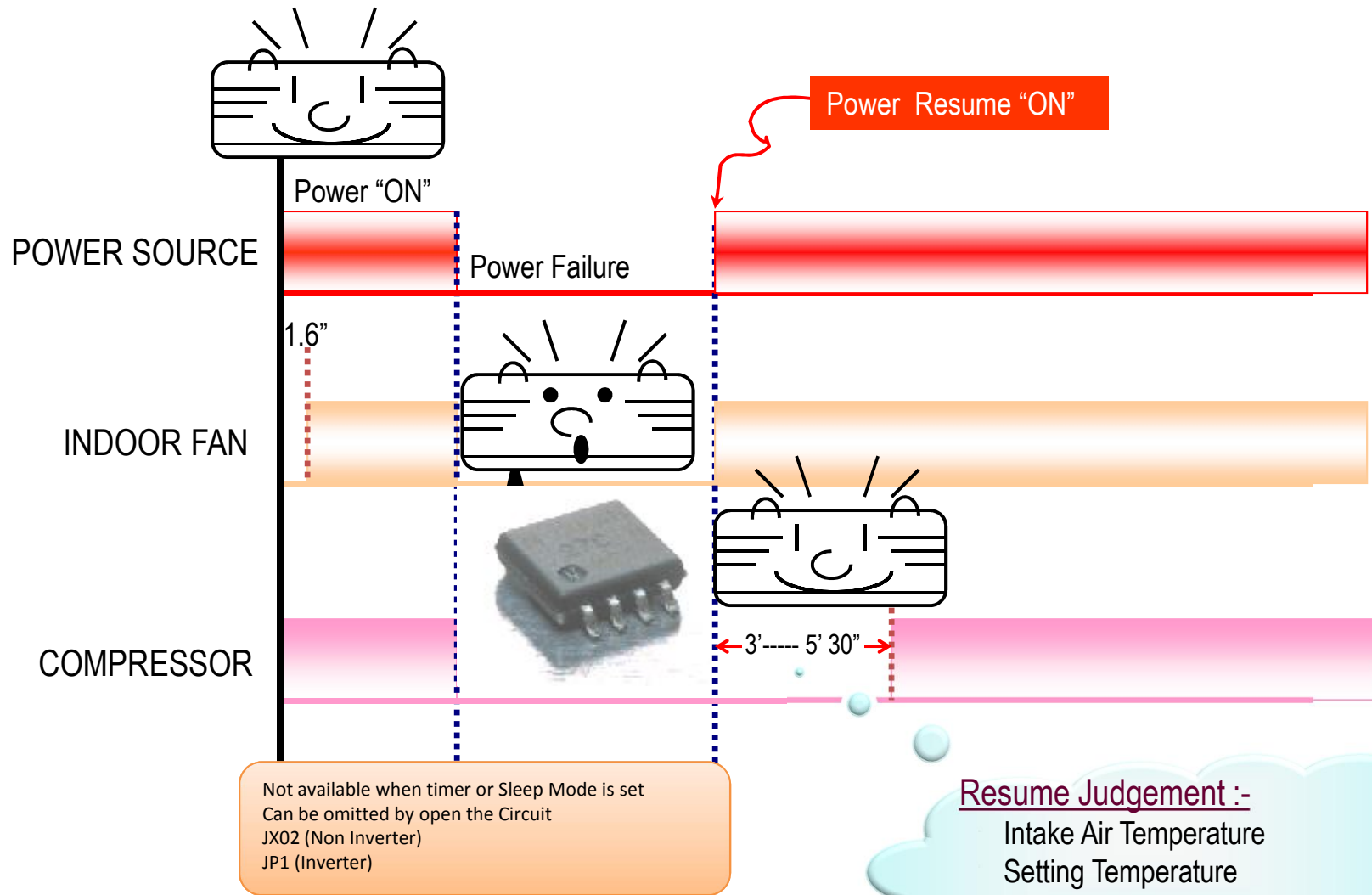
## Resistance of Compressor Windings

MODEL	CU-K18NKF
CONNECTION	2RD132X3AA03
U-V	0.858Ω
U-W	0.858Ω
V-W	0.858Ω

## Resistance of Compressor Windings

MODEL	CU-K24NKF
CONNECTION	2KD240X5AA03
U-V	0.720Ω
U-W	0.726Ω
V-W	0.708Ω

## RANDOM AUTO RESTART

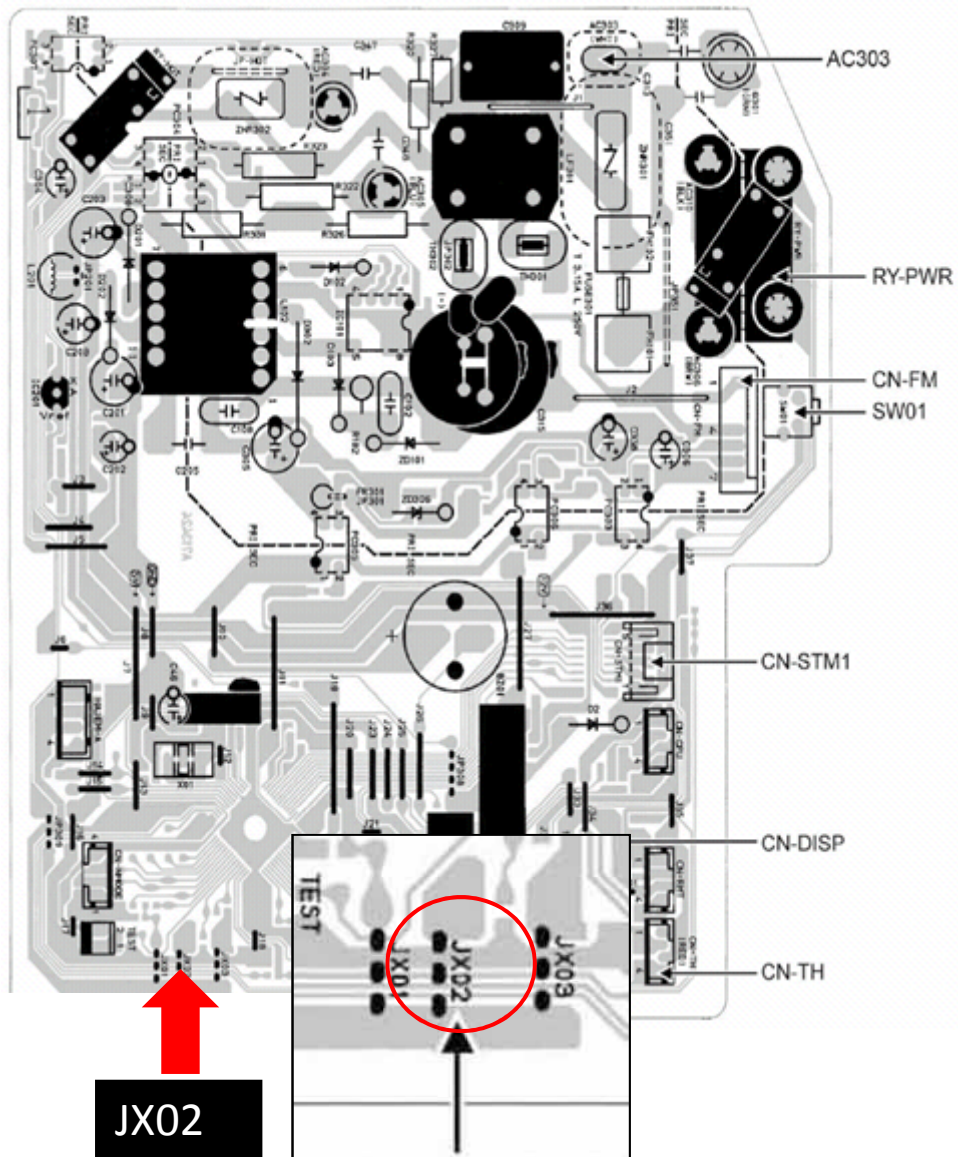


### **By default (Short)**

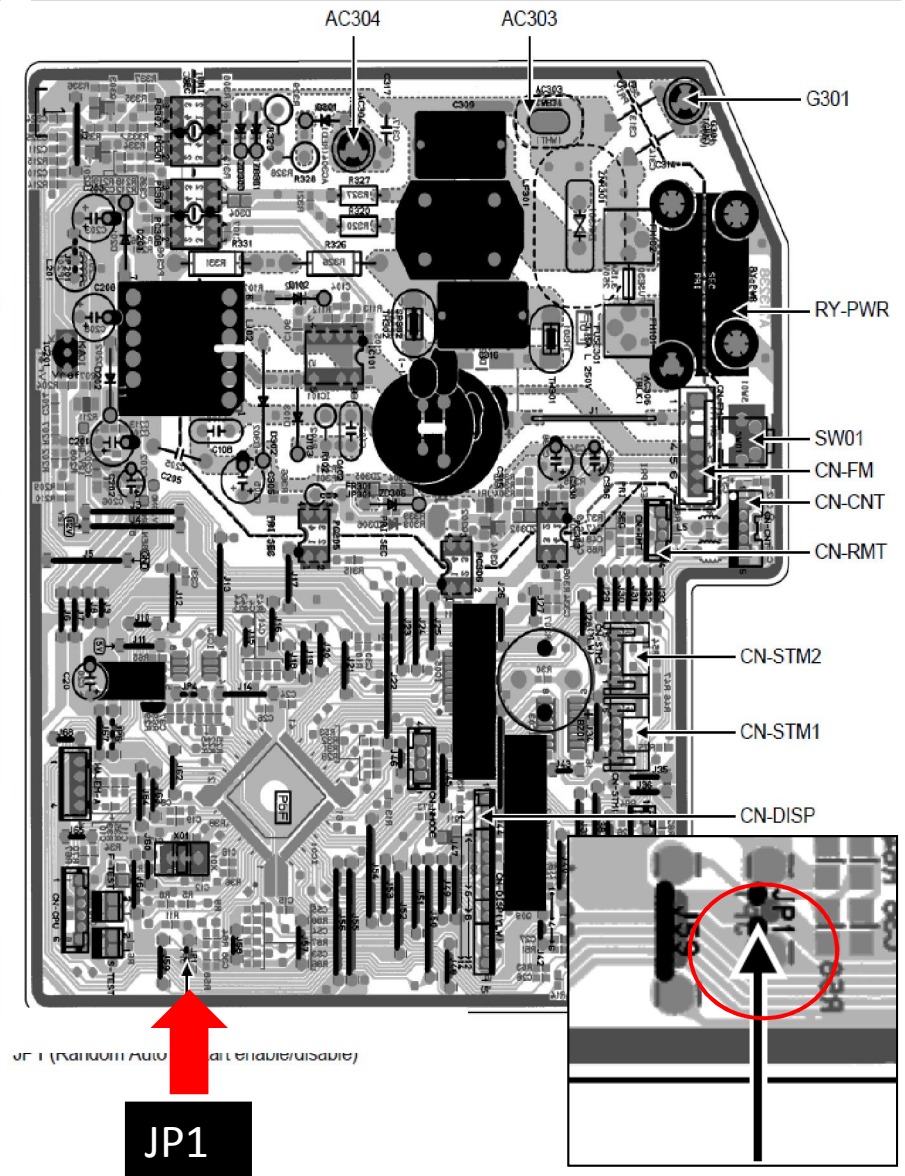
The Air conditioner resume it operation when power is back

## RANDOM AUTO RESTART (ENABLE/DISABLE)

### NON-INVERTER



### INVERTER



# **INVERTER TECHNOLOGY**

**Panasonic**

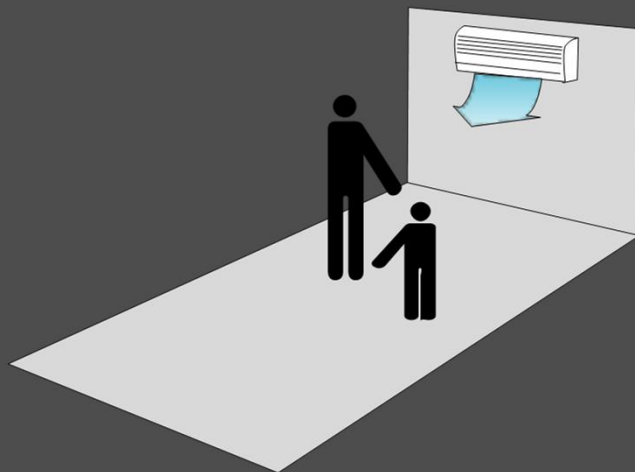
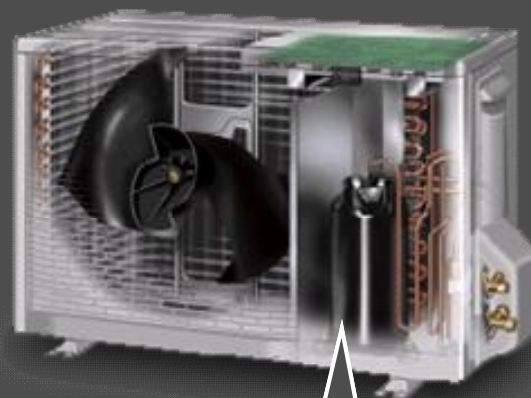
## FEATURE INTRODUCTION- INVERTER

### Inverter Technology

A microprocessor controls compressor rotation speed so that power changes to match conditions for optimum operation.

*Wide power, flexible control*

Compressor Rotation Speed is adjustable according to load.



**Panasonic**



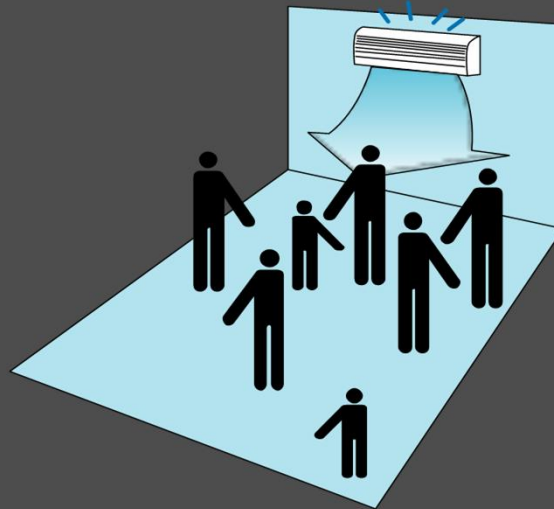
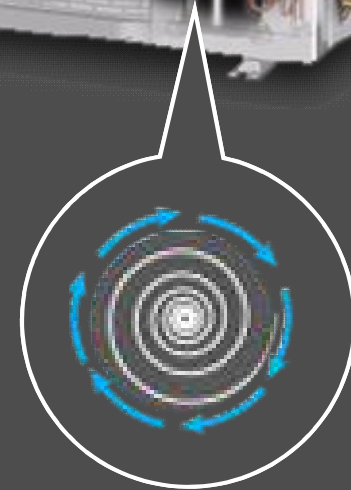
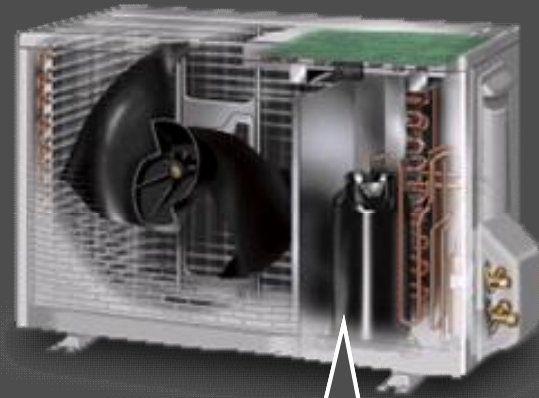
## FEATURE INTRODUCTION- INVERTER

### Inverter Technology

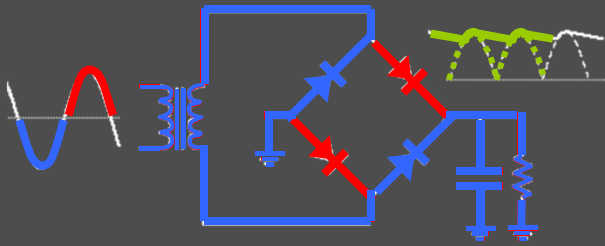
A microprocessor controls compressor rotation speed so that power changes to match conditions for optimum operation.

*Wide power, flexible control*

Compressor Rotation Speed is slow to operate at full power



## Inverter Technology

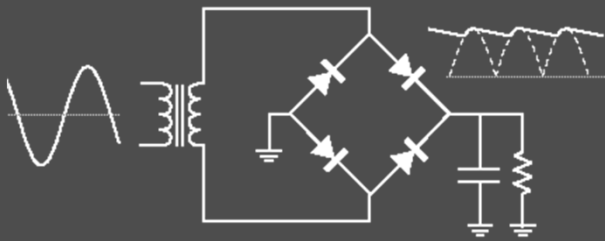


AC-DC Rectifier Circuit

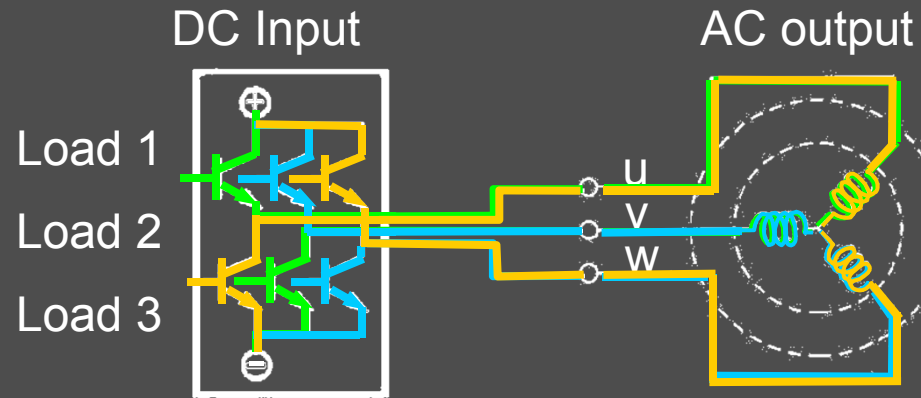


## FEATURE INTRODUCTION- INVERTER

### Inverter Technology



AC-DC Rectifier Circuit



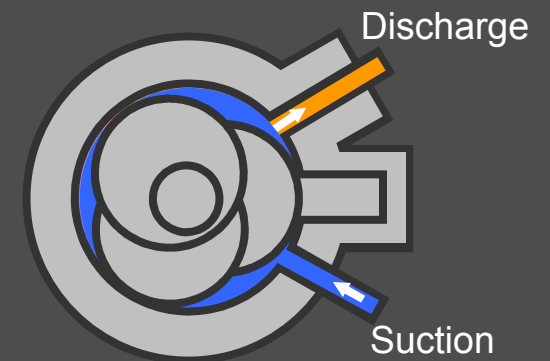
Power Transistor  
(Intelligent Power Module)

Rotary Compressor  
With Hermetic Motor

Beginning to compression    Load 1 :  $U \rightarrow V$   
Rotation :  $0^\circ - 120^\circ$

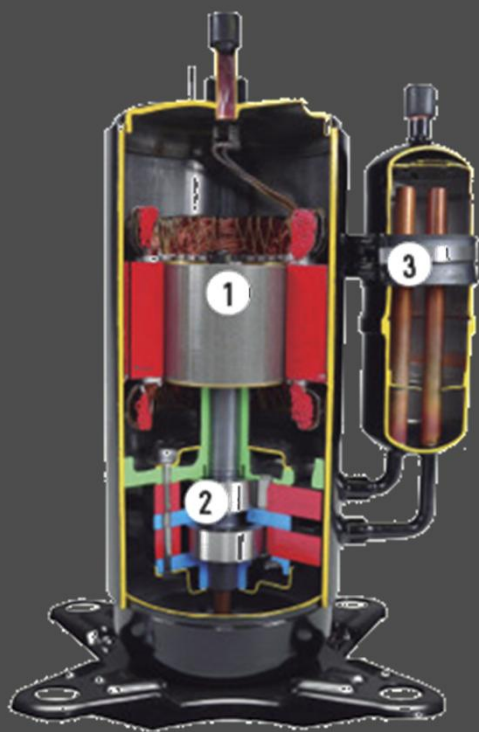
Compression continue.    Load 2 :  $V \rightarrow W$   
New intake stroke continue. Rotation :  $120^\circ - 240^\circ$

Compressed vapor  
discharged to condenser.    Load 3 :  $W \rightarrow U$   
Rotation :  $240^\circ - 360^\circ$



## Inverter Technology

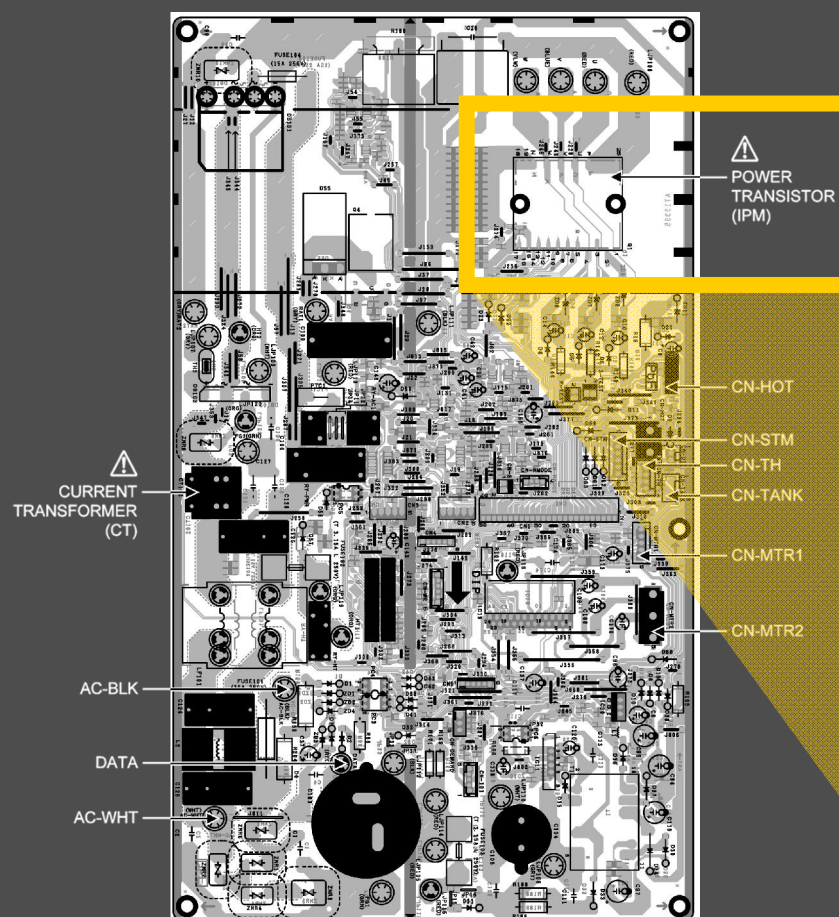
Rotary Compressor  
With Hermetic Motor



1. Motor to create rotation for compression.
2. Cylinder to form a compression chamber.
3. Accumulator accommodates generous refrigerant amounts needed in longer line length installation.

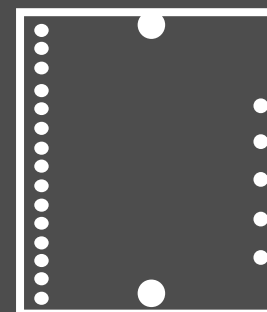
## FEATURE INTRODUCTION- INVERTER

### Inverter Technology



#### Power Transistor (Intelligent Power Module)

From  
Micon



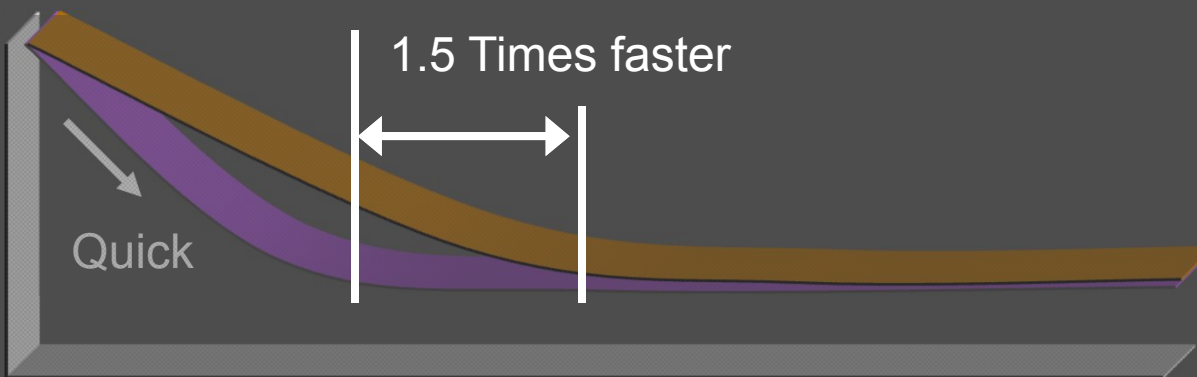
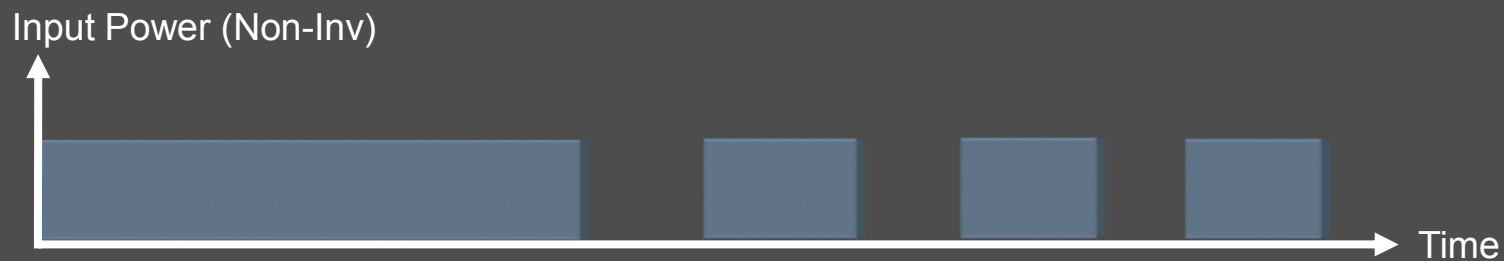
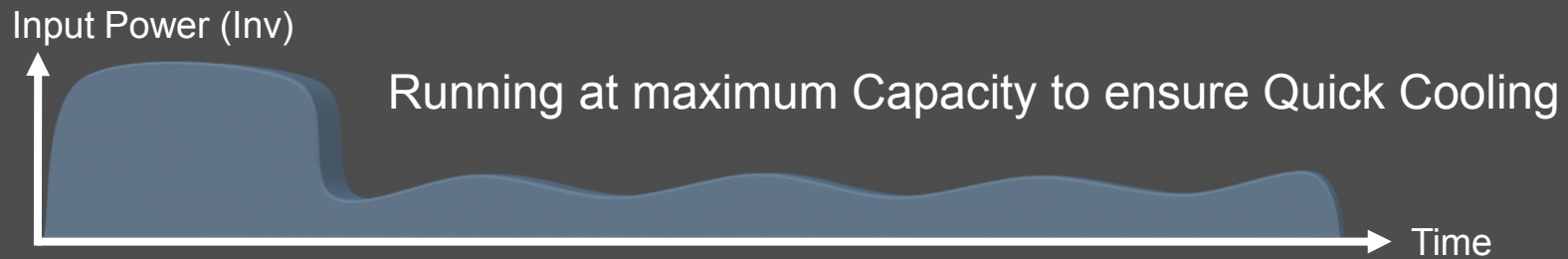
P (+)  
U  
V  
W  
N (-)

P-N Voltage  
 $265V_{DC} \sim 325V_{DC}$

When damage, possible caused Error Code:  
F99 – DC Peak detection  
F96 – Power Transistor overheating protection  
F93 – Compressor abnormal revolution  
F90 – Power Factor Correction circuit protection

## FEATURE INTRODUCTION- INVERTER

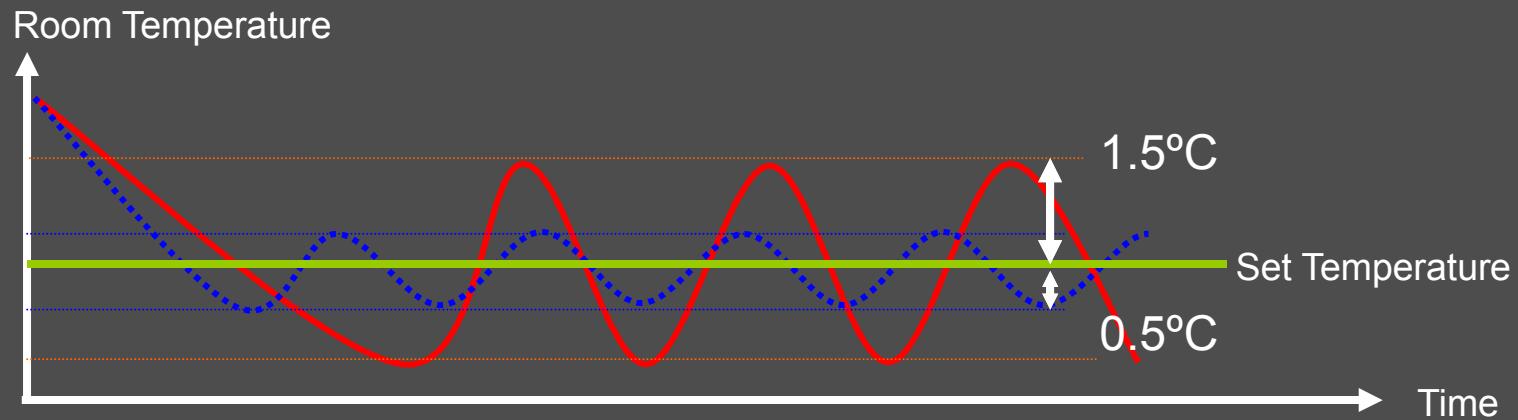
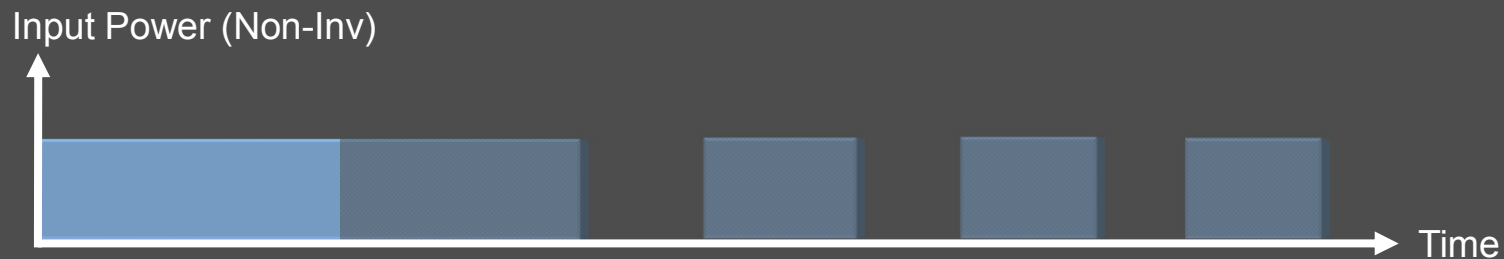
### Inverter Technology



**Panasonic**

## FEATURE INTRODUCTION- INVERTER

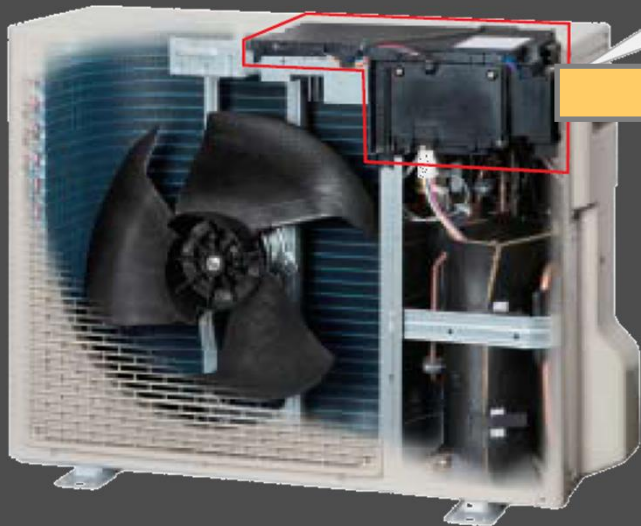
### Inverter Technology



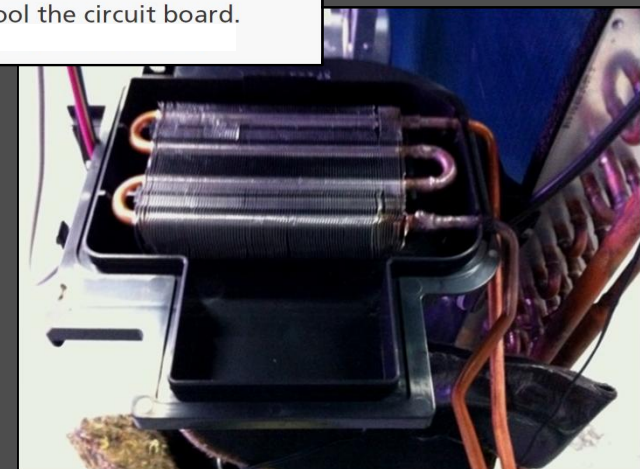
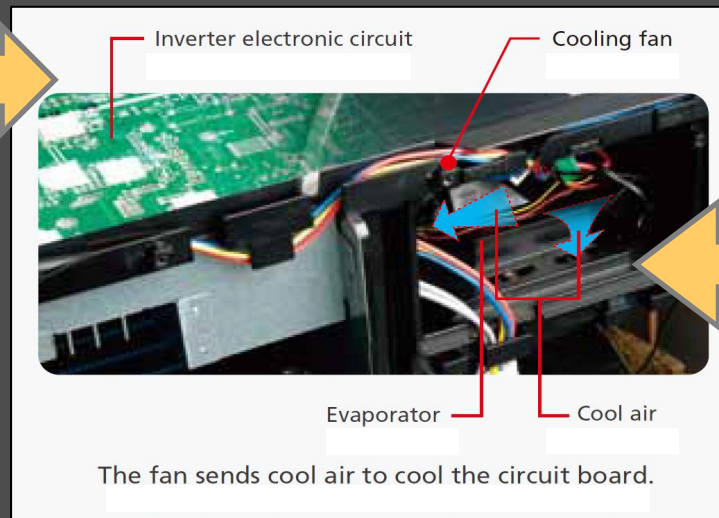
## FEATURE INTRODUCTION- **SUPER TROPICAL** INVERTER

### Unique auto-cooling system in the outdoor unit

A tightly sealed electrical component box prevents fine sand particles from getting in the high-precision inverter circuit and an original **auto cooling system** prevents the temperature inside the box from rising due to heat generated by the circuit board



Tightly Sealed Electric Component

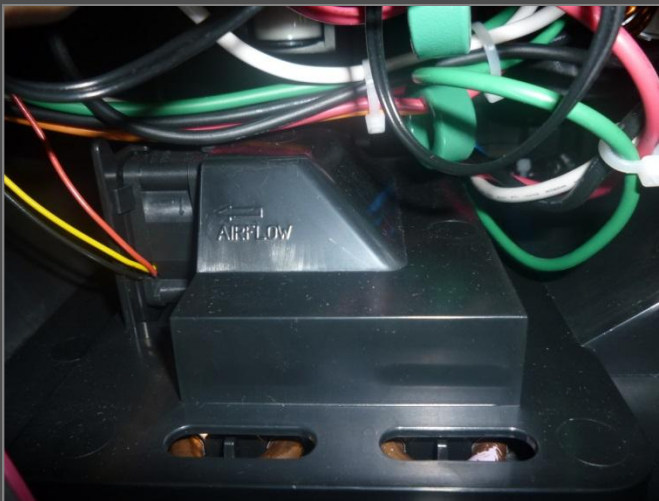
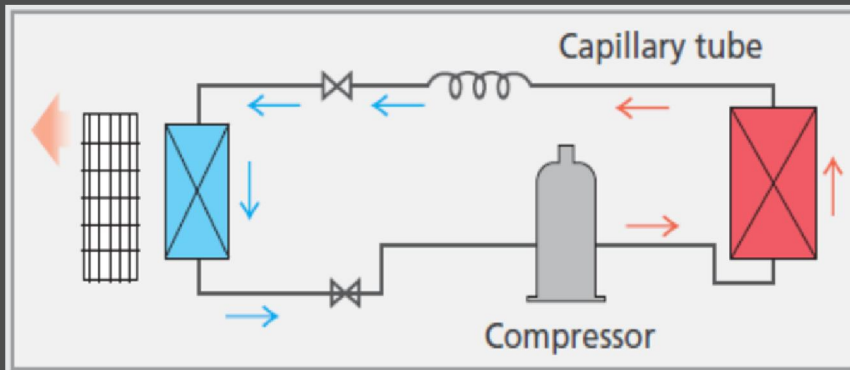


**Applicable Models: CU-K18NKY and CU-K24NKY**

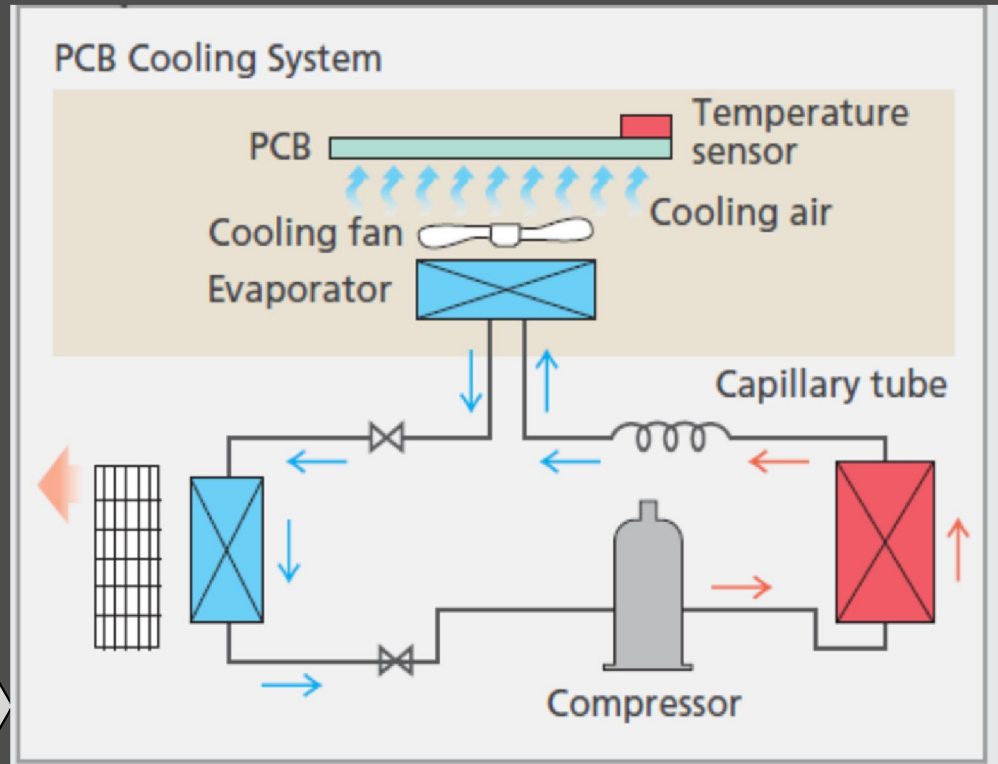


## FEATURE INTRODUCTION- **SUPER TROPICAL** INVERTER

### CONVENTIONAL LAYOUT



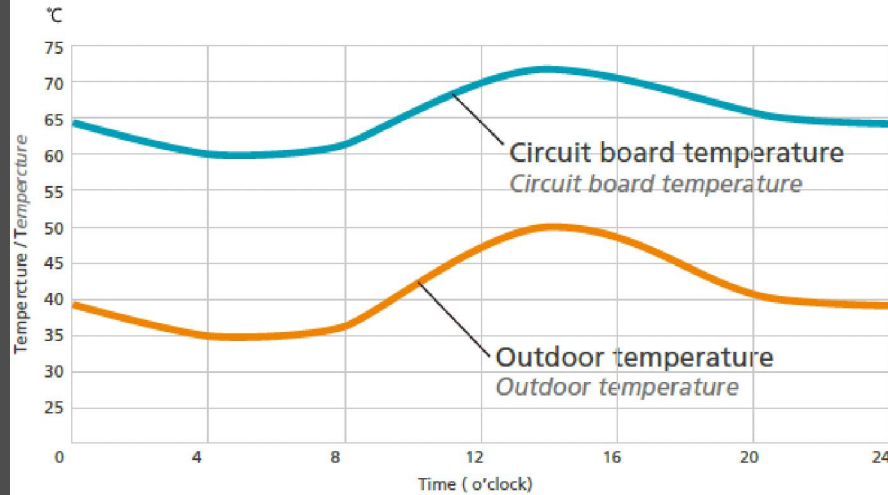
### **TROPICAL INVERTER LAYOUT**



The new outdoor unit design uses cool refrigerant and a fan to prevent the temperature of the electronic circuitry rising.

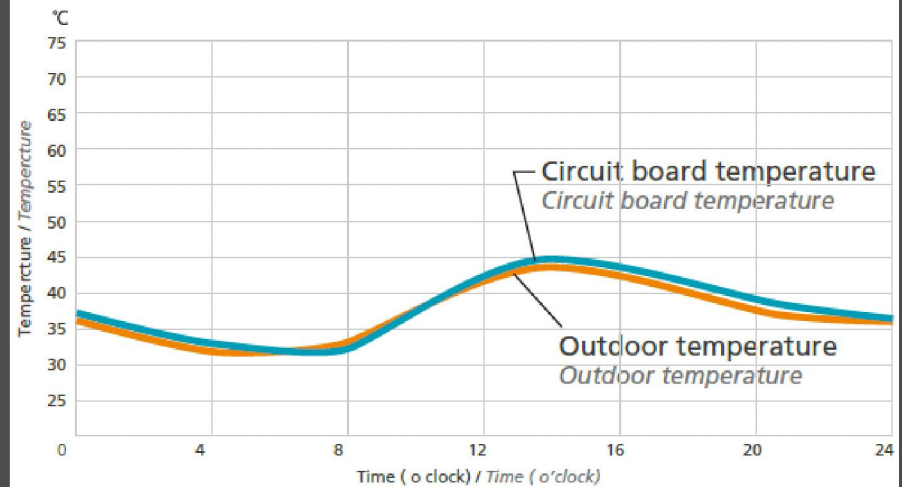
## FEATURE INTRODUCTION- SUPER TROPICAL INVERTER

Without the Auto-Cooling System / Without the Auto-Cooling System



Temperature inside the electrical component box > than the outside air temperature, and reached close to 80°C during the day.  
Significant damage to the control system.

Auto-Cooling System / Auto-Cooling System



During the hottest part of the day, the temperature inside the electrical component box almost the same as the outside air temperature.  
Hardly can damage to the control system.



# **SAFETY PROTECTION CONTROL**

## SAFETY PROTECTION CONTROL

### CU/CS-9/12/18QKE

#### COOLING MODE

#### Restart Control ( Time Delay Safety Control)

- The Compressor will not turn on within 3 minutes from the moment operation stops, although the unit is turned on again by pressing OFF/ON button at remote control within this period.
- This control is not applicable if the power supply is cut off and on again.
- This phenomenon is to balance the pressure inside the refrigerant cycle.

#### Total Running Current

1. Total running current (AC)> X value, the frequency for compressor will be decreased.
2. Running current < X value for 5 seconds, the frequency for compressor will be increased.
3. If total outdoor unit running current > Y value, compressor will be stopped immediately for 3 minutes.

Model	YE9QKE/UE9QKE		YE12QKE/UE12QKE		UE18QKE	
Operation mode	X(A)	Y(A)	X(A)	Y(A)	X(A)	Y(A)
Cooling /Soft dry (A)	5.05	15.02	6.75	15.02	8.76	14.76
Cooling /Soft dry (B)	4.57		6.22		8.25	
Cooling /Soft dry (C)	4.57		6.22		8.25	
Heating	4.65		5.92		9.50	

## SAFETY PROTECTION CONTROL

### CU/CS-RE9/12/15NKE

#### COOLING MODE

#### Restart Control ( Time Delay Safety Control)

- The Compressor will not turn on within 3 minutes from the moment operation stops, although the unit is turned on again by pressing OFF/ON button at remote control within this period.
- This control is not applicable if the power supply is cut off and on again.
- This phenomenon is to balance the pressure inside the refrigerant cycle.

#### Total Running Current

1. If the outdoor unit total running current is detected exceeding I(A), the frequency instructed for compressor operation will be decreased.
2. If the running current does not exceed I(A) for 5 seconds, the frequency instructed will be increased.

Model	RE9NKE	RE12NKE	RE15NKE
Operation mode	I,(A)	I,(A)	I,(A)
Cooling /Soft dry (A)	6.02	6.9	7.49
Cooling /Soft dry (B)	5.88	6.9	7.36
Cooling /Soft dry (C)	5.03	6.9	6.9
Heating	5.04	6.88	8.48

## SAFETY PROTECTION CONTROL

### CU/CS-RE18/24NKE

#### COOLING MODE

#### Restart Control ( Time Delay Safety Control)

- o The compressor will not start for three minutes after stop of operation.
- o This control is not applicable if the power supply is cut off and on again or after 4-way valve de-ices condition.

#### Total Running Current

- 1 When the outdoor unit total running current (AC) exceeds X value, the frequency instructed for compressor operation will be decreased.
- 2 If the running current does not exceed X value for five seconds, the frequency instructed will be increased.
- 3 However, if total outdoor unit running current exceeds Y value, compressor will be stopped immediately for three minutes.

Model	RE18NK		RE24NK	
Operation mode	I,(A)	Y(A)	I,(A)	Y(A)
Cooling /Soft dry (A)	11.81	14.75	15.03	19.02
Cooling /Soft dry (B)	8.91		13.63	
Cooling /Soft dry (C)	-	-	15.03	
Heating	10.07	14.75	13.35	

## SAFETY PROTECTION CONTROL

### CU/CS-UE9/12/18QKE

#### COOLING MODE

#### IPM ( Power Transistor ) Prevention Control

##### Overheating Prevention Control

- 1 When the IPM temperature rises to 120°C, compressor operation will stop immediately.
- 2 Compressor operation restarts after 3 minutes the temperature decreases to 110°C.
- 3 If this condition repeats continuously 4 times within 20 minutes, timer LED will be blinking ("F96" is indicated).

##### DC Peak Current Control

- 1 When electric current to IPM  $>16.0 \pm 2.0\text{A}$  (YE,UE9/12QKE) and  $20.2 \pm 2.7\text{A}$  (UE18QKE), Compressor will stop operate. Operation will restart after 3 minutes.
- 2 If the set value again  $>30$  seconds after the compressor starts, operation will restart after 3 minute.
- 3 If the set value exceeded again within 30 seconds after the compressor starts, the operation will restart after 1 minute. If this condition repeats **continuously for 7 times**, all indoor and outdoor relays will be cut off, timer LED will be blinking ("F99" is indicated).

## SAFETY PROTECTION CONTROL

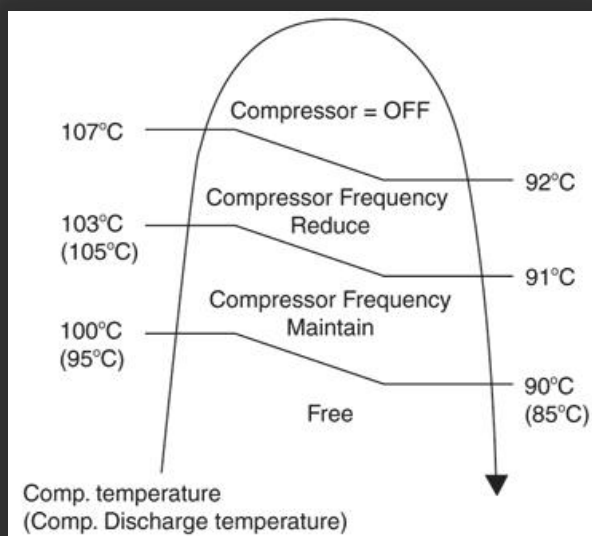
### CU/CS-UE9/12/18QKE

#### COOLING MODE

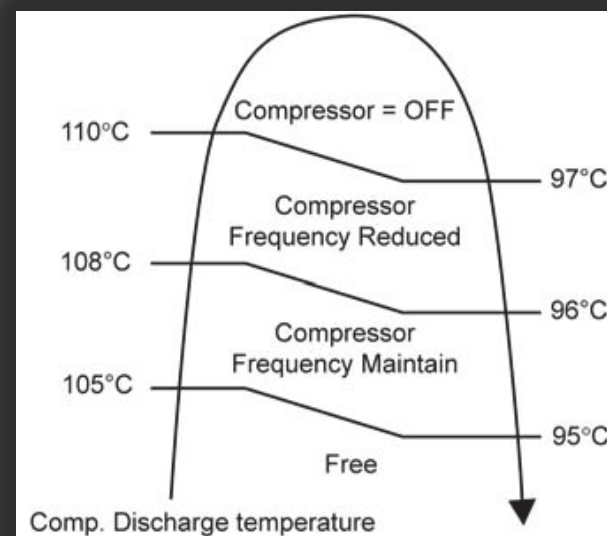
#### Compressor Overheating Protection Control

Instructed frequency for compressor operation will be regulated by compressor top temperature. The changes of frequency are as below figure.

If compressor discharge temperature exceeds 107°C (RE18QK) and 112°C (RE24QK), compressor will be stop, occurs 4 times per 20 minutes, timer LED will be blinking ("F97" is to be confirmed).



RE18K



RE24K

## SAFETY PROTECTION CONTROL

### CU/CS-UE9/12/18QKE

#### COOLING MODE

#### Low Pressure Protection Control

##### Control start conditions

For 5 minutes, the compressor continuously operates and outdoor total current is between 1.22A and 1.38 A (YE,UE9/12QKE), between 0.75A and 0.95A (UE18QKE).

##### During Cooling and Soft Dry operations:

Indoor suction temperature - indoor piping temperature is below 4°C.

##### Control contents

Compressor stops (and restart after 3 minutes).

If the conditions above happen 2 times within 20 minutes, the unit will:

Stop operation

Timer LED blinks and "F91" indicated.

## SAFETY PROTECTION CONTROL

### CU/CS-UE9/12/18QKE

#### COOLING MODE

#### Low Frequency Protection 1

When the compressor operate at frequency lower than 24 Hz continued for 20 minutes, the operation frequency will be changed to 23 Hz for 2 minutes.

#### Low Frequency Protection 2

When all the below conditions comply, the compressor frequency will change to lower frequency.

Temperature T for	Cooling / Soft dry	Heating
Indoor intake air (°C)	$T < 14$ or $T > 30$	$T < 14$ or $T > 28$
Outdoor air (°C)	$T < 13$ or $t > 38$	$T < 4$ or $T > 24$
Indoor heat exchanger (°C)	$T < 30$	$T > 0$



## SAFETY PROTECTION CONTROL

### CU/CS-UE9/12/18QKE

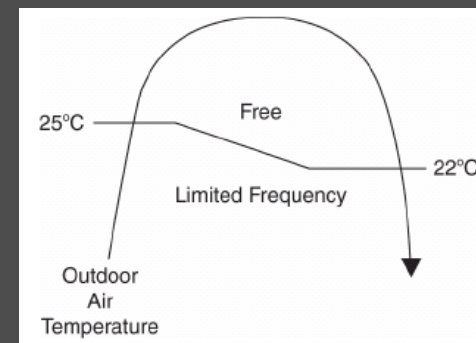
#### COOLING MODE

#### Outdoor Air Temperature Control Cooling and Soft Dry Mode

The compressor operating frequency is regulated in accordance to the outdoor air temperature as shown in the diagram below.

This control will begin 1 minute after the compressor starts.

Compressor frequency will adjust base on outdoor air temperature.



#### Cooling Overload Protection

Detects the Outdoor pipe temperature and carry out below restriction/limitation (Limit the compressor Operation frequency).

The compressor stop if outdoor pipe temperature exceeds 61°C.

If the compressor stops 4 times in 20 minutes, Timer LED blinking (F95 indicated: outdoor high pressure rise protection).

## SAFETY PROTECTION CONTROL

### CU/CS-UE9/12/18QKE

#### COOLING MODE

##### Freeze Prevention Control 1

When indoor heat exchanger temperature is lower than 0°C continuously for 6 minutes, compressor will stop operating.

Compressor will resume its operation 3 minutes after the indoor heat exchanger is higher than 5°C.

At the same time, indoor fan speed will be higher than during its normal operation.

If indoor heat exchanger temperature is higher than 5°C for 5 minutes, the fan speed will return to its normal operation.

##### Freeze Prevention Control 2

Control start conditions

- o During Cooling operation and soft dry operation

During thermo OFF condition, indoor intake temperature is less than 10°C or

Compressor stops for freeze prevention control

- o Either one of the conditions above occurs 5 times in 60 minutes.

Control contents

- o Operation stops
- o Timer LED blinks and "H99" indicated

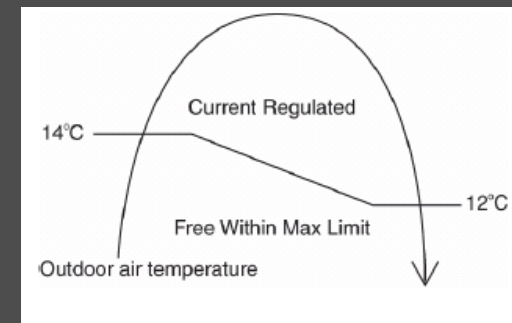
## SAFETY PROTECTION CONTROL

### CU/CS-UE9/12/18QKE

#### HEATING MODE

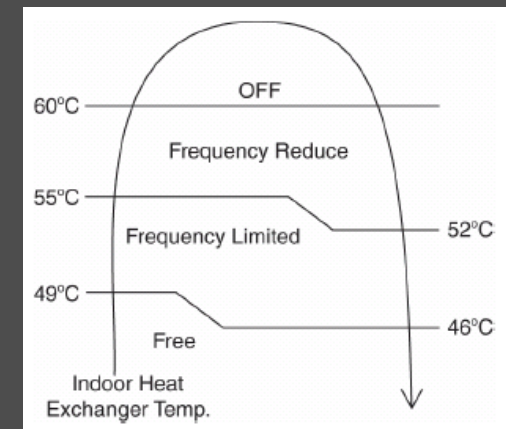
##### Outdoor Air Temperature Control

The Max current value is regulated when the outdoor air temperature rise above 14°C in order to avoid compressor overloading.



##### Overload protection control

The compressor operating frequency is regulated in accordance to indoor heat exchanger temperature as shown below. If the heat exchanger temperature exceeds 60°C, compressor will stop.



## SAFETY PROTECTION CONTROL

### CU/CS-UE9/12/18QKE

#### HEATING MODE

##### Low Oil Return

In heating operation , if the outdoor temperature falls below -10°C when compressor starts, the compressor frequency will be regulated Up to 600 seconds.

##### Cold Draft Prevention Control

When indoor pipe temperature is low, cold draft operation starts where indoor fan speed will be reduced.

##### Deice Prevention

When outdoor pipe temperature and outdoor air temperature is low, deice operation start where indoor fan motor and outdoor fan motor stop and operation LED blinks.

[illegible]

**Start condition:-** When outdoor unit piping temperature  $< 9^{\circ}\text{C}$  and operating continuously for 40 minutes. If either one of following conditions is achieved, the unit enters deice operation.

1. Outdoor piping temp.  $< 3^{\circ}\text{C}$  and continuously for 3 minutes.
2. Outdoor temperature is under  $-10^{\circ}\text{C}$ , outdoor piping temp.  $5^{\circ}\text{C}$  and continuously for 3 minutes.

**End condition:-** When the outdoor piping temperature rises to 18 °C, deice operation ends.

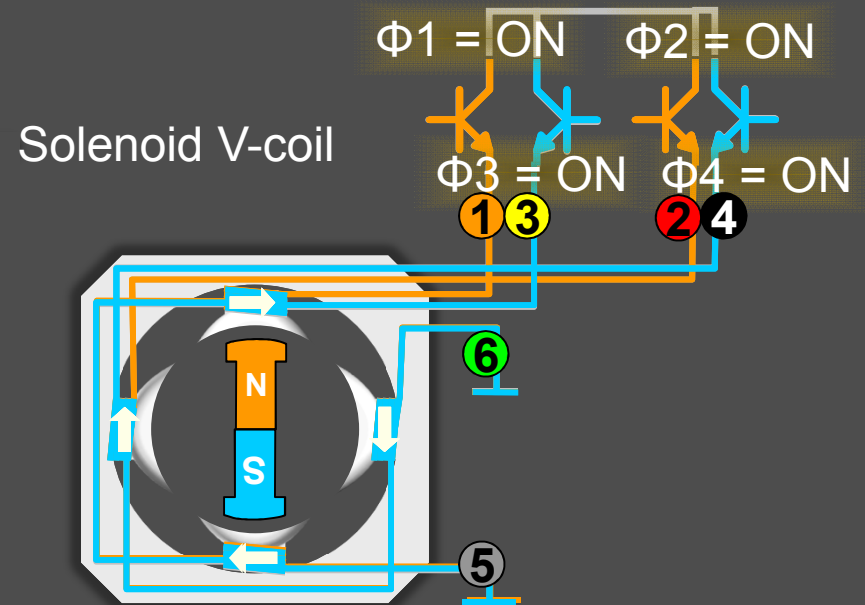
## OPERATION CONTROL

### Solenoid Expansion Valve

8 pulses is required to complete one cycle.  
Thus, full opening/closing (480 pulses)  
required 60 cycles.

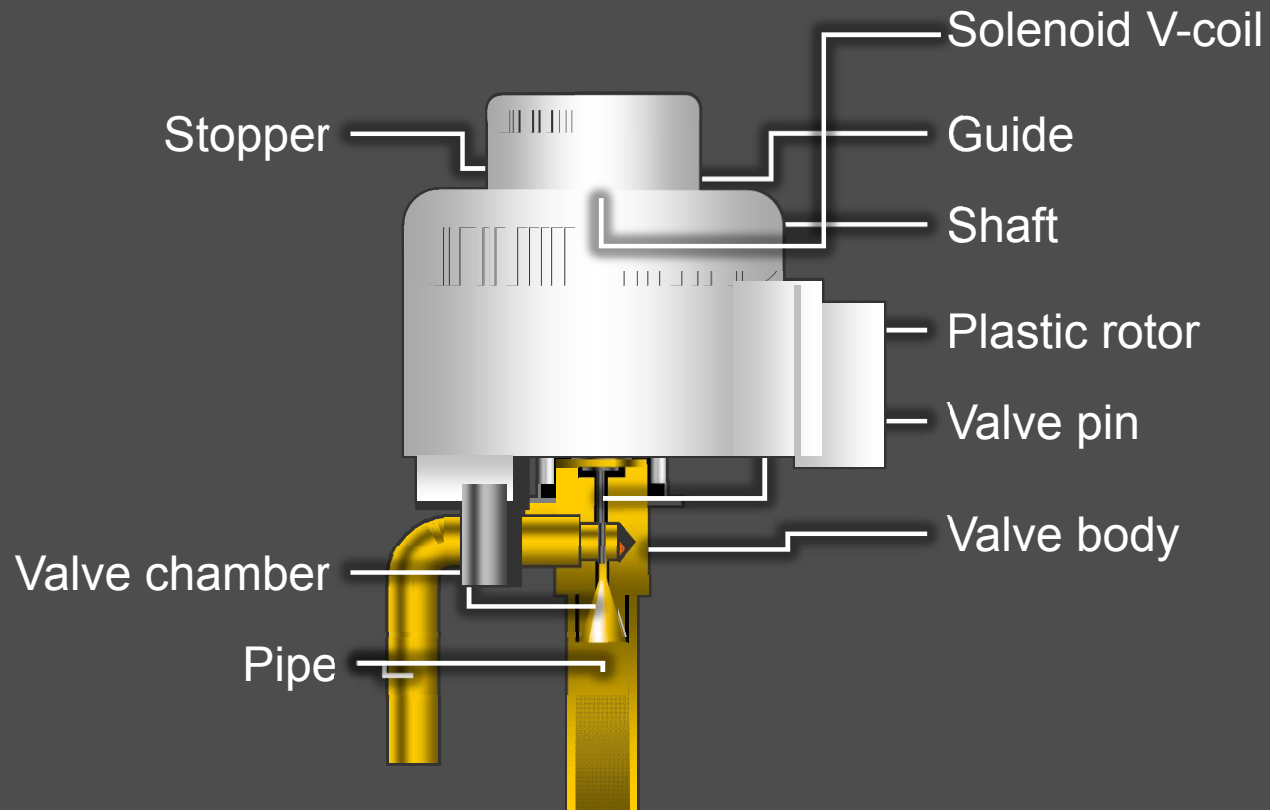


Motor Drive Method: Unipolar drive



Phase No.	Lead Wire Color	Switching Mode							
		1	2	3	4	5	6	7	8
Φ1	Orange	1	1	0	0	0	0	0	1
Φ2	Red	0	1	1	1	0	0	0	0
Φ3	Yellow	0	0	0	1	1	1	0	0
Φ4	Black	0	0	0	0	0	1	1	1
Pulses		N	N+1	N+2	N+3	N+4	N+5	N+6	N+7

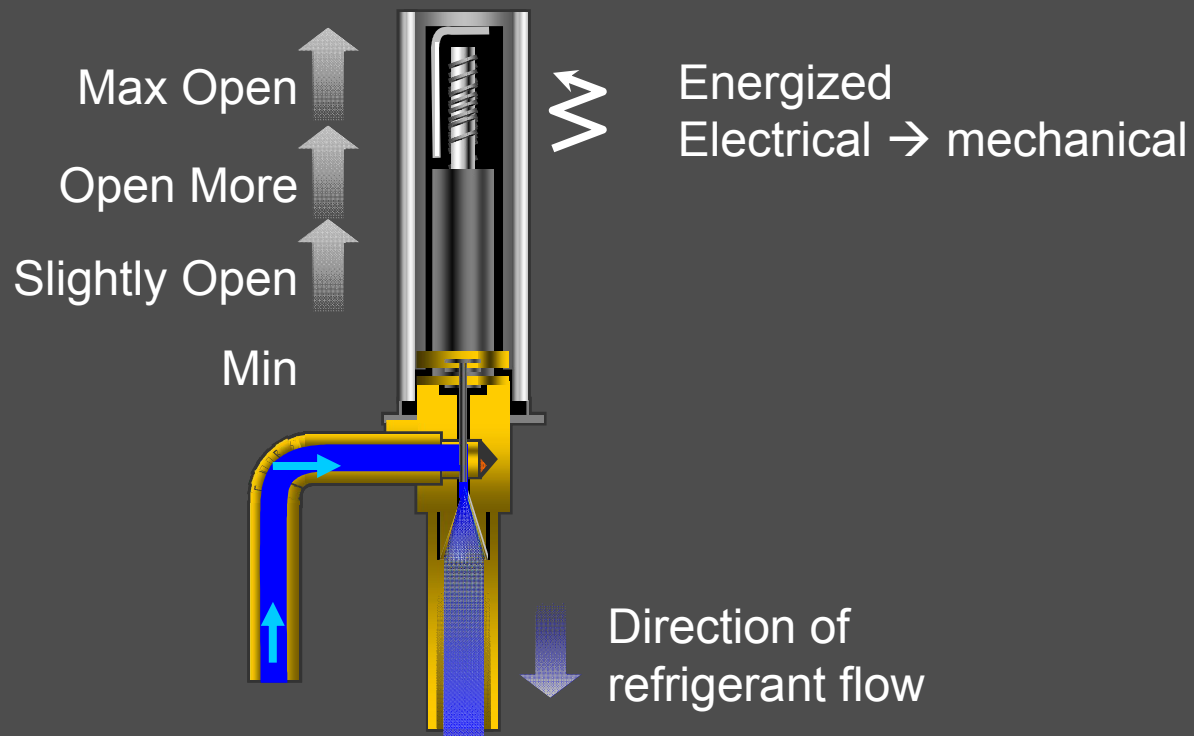
# Solenoid Expansion Valve



## OPERATION CONTROL

# Solenoid Expansion Valve

Cooling – Control amount of refrigerant to the indoor unit.

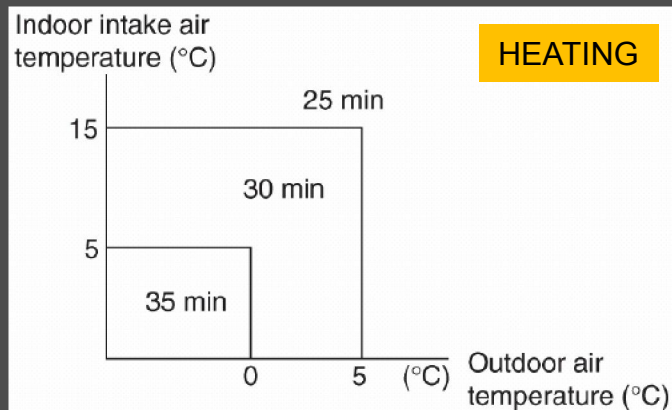
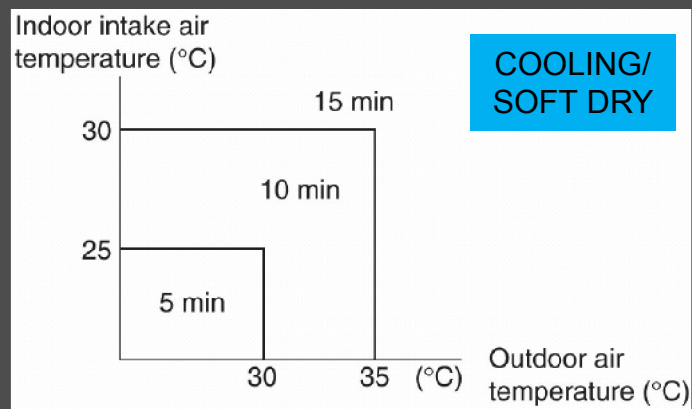




## PRE-TIMER OPERATION CONTROL

### Enhancement control for comfort feature.

Room comfortable environment is ready once the set time is reached .



### Inverter Control :

1. 60 minutes before ON timer set time, outdoor fan on & indoor fan run at Lo- speed.
2. Respectively run for 30 seconds to sample outdoor & indoor air temperature.
3. Based on the detected indoor and outdoor air temperatures, a **preliminary operation** starting time is set.

**During sampling, operation LED lamp blinks and timer LED lamp ON.**

### Non Inverter Control :

1. No sampling process.
2. Unit will switch on 15min before the set time

# **TROUBLE SHOOTING GUIDES**

## **(GENERAL)**

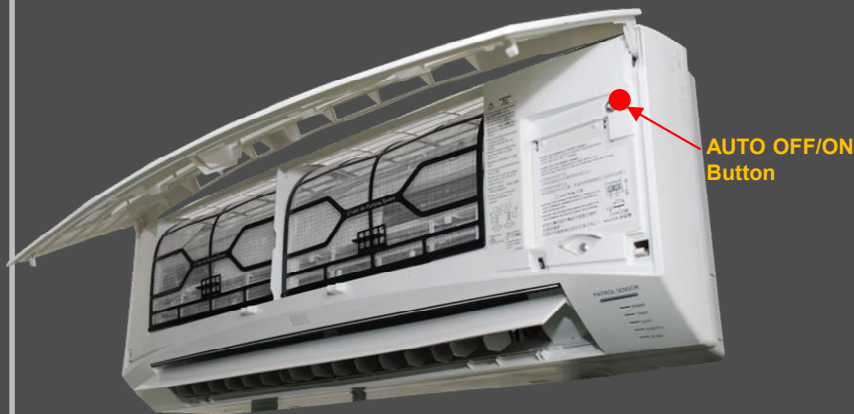
## Self diagnosis function-Inverter

To check refrigerant pressure & running current, compressor must be operating at prefixed mode.

These method also used for pump down purpose.

### Non Inverter / Inverter:

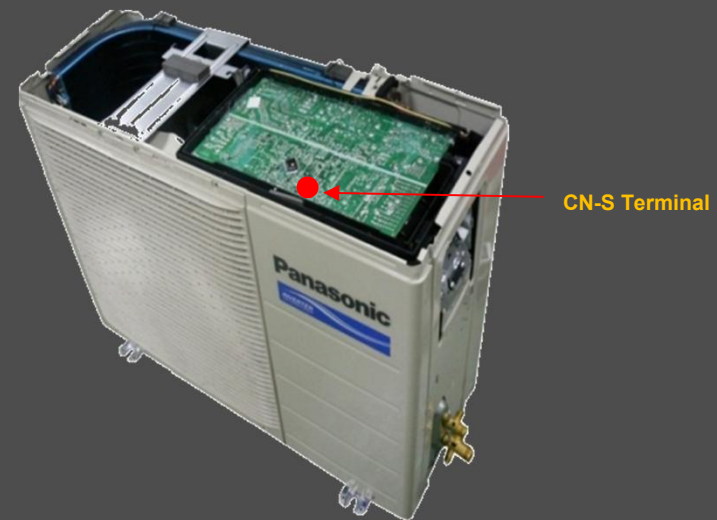
The compressor speed always fixed .



During power standby, press **Auto OFF/ON** button continuously for 5~8sec until one beep sound.  
To cancel TEST RUN operation press the again Auto OFF/ON button

### Inverter:

The compressor speed fixed at Fc.



During power standby, short the CN-S terminal at outdoor PCB.

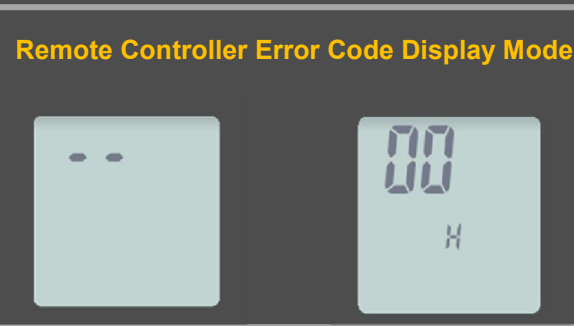
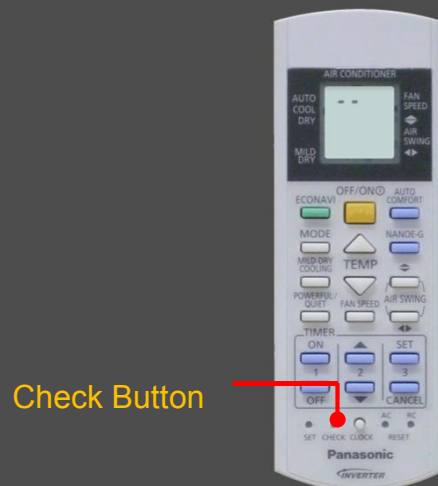
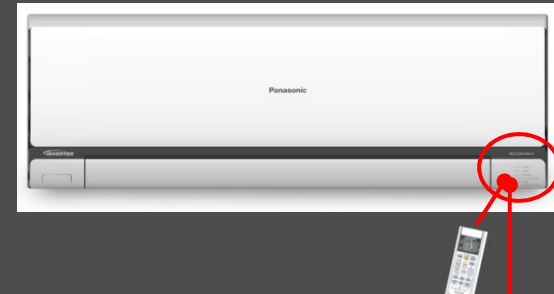
# Self diagnosis function-Inverter

Inverter Model Equipped with a self diagnosis feature.

Once the abnormal happened, the unit will stop its operation and timer LED blinks with an error code memorized in the IC memory.

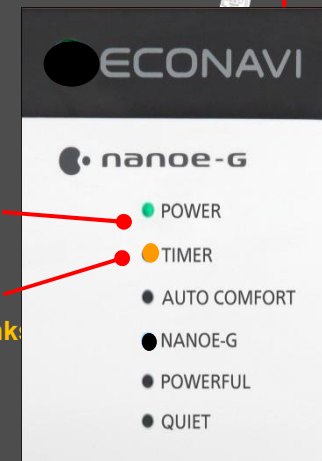
## How To Check Error Code

1. Turn the Aircon ON
2. When abnormal detected, system will stop & Timer LED blinks.
3. Press check button on remote controller for 5 sec ,the screen will display the error code mode .
4. Press timer up/down buttons to confirm the latest error code detected.



Power  
LED ON

Timer  
LED Blink



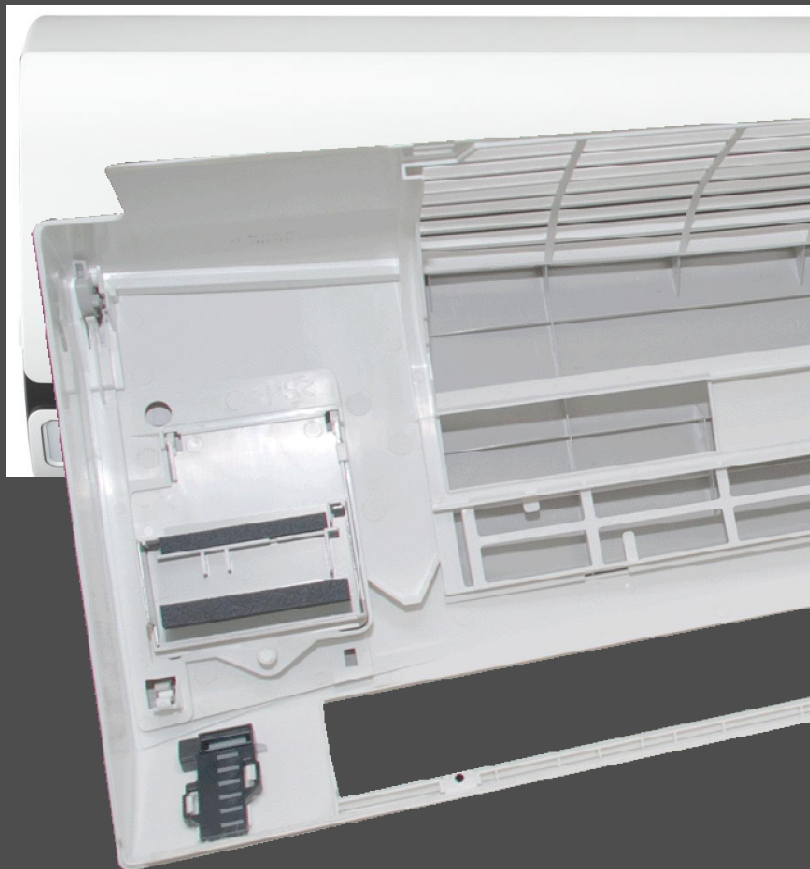
### Note:

- Error Code Confirmation Power Indicator on 30sec and buzzer sound (beep. beeb.) 5sec.
- Signal Transmission confirmation Power Indicator blinks .5sec without buzzer sound.(Indoor acknowledge the remote controller signal only)
- After breakdown repair , the Timer LED will not blink, the last error code will be stored in IC memory

## Error code table-Inverter

The error code table

- Attach summary of error code and the primary location of parts to verify.



### DIAGNOSTIC DISPLAY

### 診斷顯示

#### Diagnostic method

(Way to retrieve abnormality memory)

During stop operation, when 'check' button at remote control is pressed for more than 5 seconds, diagnostic display code will be shown. When TIMER ☐ or ☐ button is pressed, diagnostic display code will be shown in sequence. When abnormality content is as same as diagnostic display code, receiving sound of 'pep pep pep....' is occurred for 4 seconds and POWER LED will lit for 30 seconds.

(Way to delete abnormality memory)

By starting cooling operation using test run operation mode, and pressing 'check' button at remote control, the previously recorded abnormalities are deleted.

#### 診斷方式

(獲取故障記憶的方法)

在停止操作中，按下遙控器上的 'check' 鍵 5 秒鐘以上，將顯示診斷顯示編碼。當按下 TIMER ☐ 或 ☐ 鍵時，診斷顯示編碼將按順序顯示。當故障內容與故障編碼一致時，將發出 '唧唧唧...' 聲長達 4 秒，並且 POWER LED (電源燈) 將亮起 30 秒。

(刪除故障記憶的方法)

通過在測試運行操作模式下開啟冷卻操作，並按遙控器上的 'check' 鍵，將刪除先前所記錄的故障。

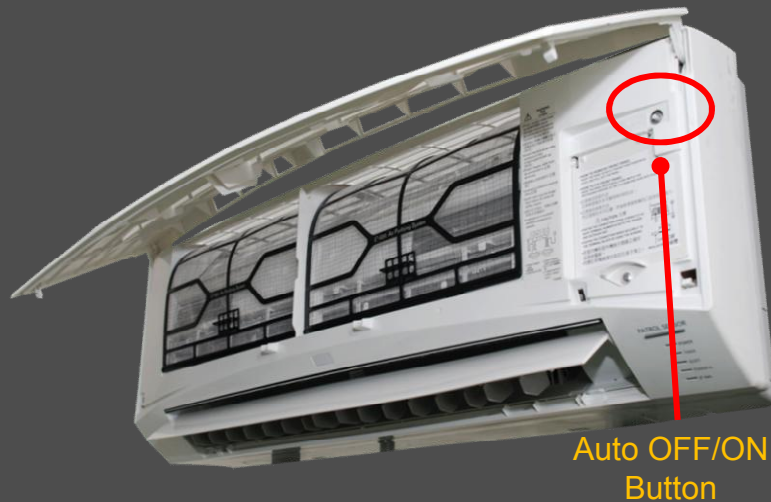
Diagnostic Display 診斷顯示	Abnormality or Protection Control Works 故障或保護控制裝置
H 00	NO ERROR 無故障
H 11	Indoor/Outdoor abnormal communication 室內 / 室外機異常通訊
H 12	Connection capability rank abnormality 連接性能等級故障
H 14	Indoor intake air temperature sensor abnormality 室內機進風口溫度傳感器故障
H 15	Outdoor compressor temperature sensor abnormality 室外機壓縮機溫度傳感器故障

# How to erase memory code- Inverter

## To Clear Memorized Error Code after Repair

- 1) Turn Power ON( in standby condition )
- 2) Press Auto button for 5 sec. ( 1 beep sound) the main unit operate in Forced Cooling(Test Run),
- 3) Press the “CHECK” button on the Remote Control for about 1 sec to transmit the signal to Indoor unit,“beep” sound is heard and the Error code is cleared.

**Step: 2 Press Auto OFF /ON button to run force cooling**



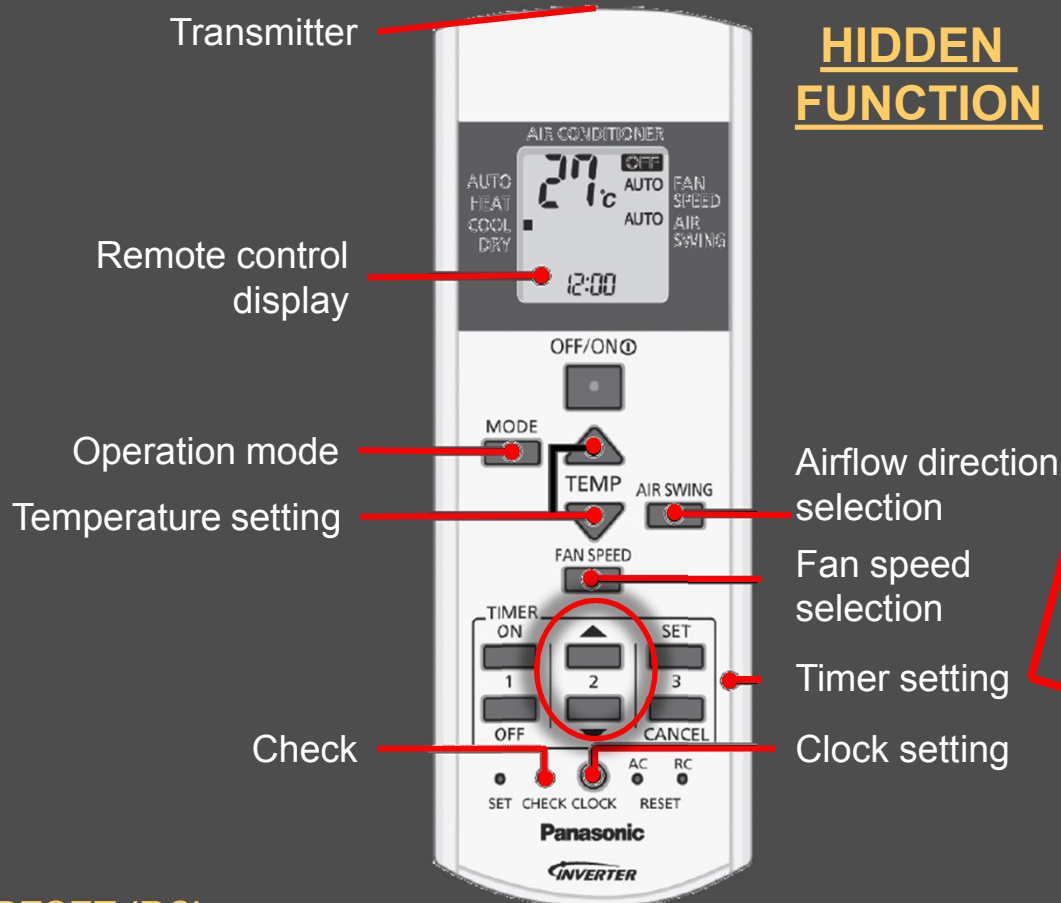
**Step: 3 Press Check button in the Remote Controller to transmit signal**

**Check Button**





# Remote control function-Inverter



## RESET (RC)

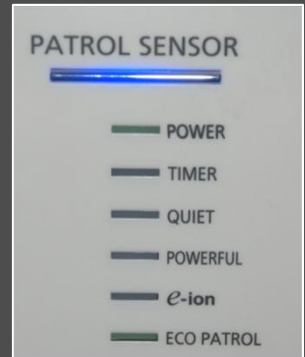
To clear and restore the remote control setting to factory default.  
o Press once to clear the memory.

## RESET (AC)

To restore the unit's setting to factory default.  
o Press once to restore the unit's setting.

Press & hold for the  
“**TIMER ▲**” key for  
5sec  
(one “pep” sound).

Brightness of  
Indicator lights  
be dim up/down



1

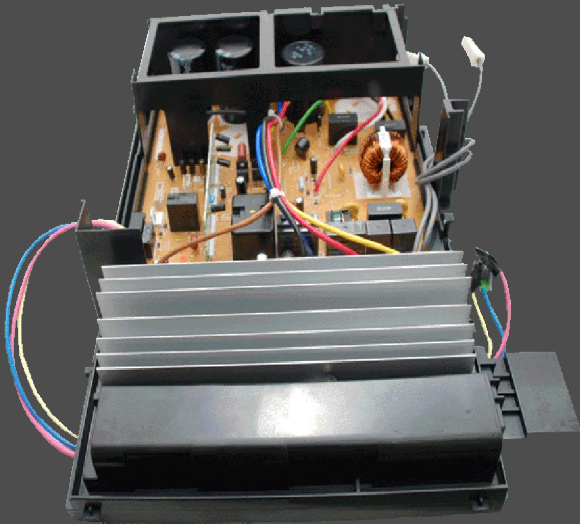
Press & hold for the “**TIMER ▼**”  
key for 10sec

Remote Temperature Display  
°C <--> °F



2

## Troubleshooting Guide - Inverter



There are a few units of high voltage capacitor at the Outdoor PCB.

During Servicing Inverter Outdoor Unit –

**Wait 2 minutes after the Main Power turned OFF, before disconnecting internal wires**



**TROUBLE SHOOTING GUIDES**  
**(INVERTER)**

# Troubleshooting Guide - Inverter

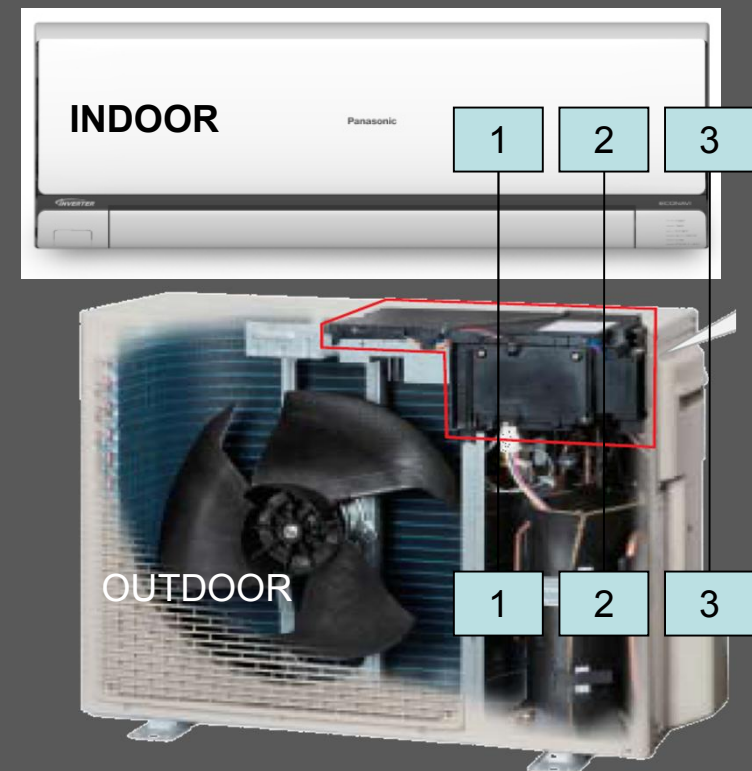
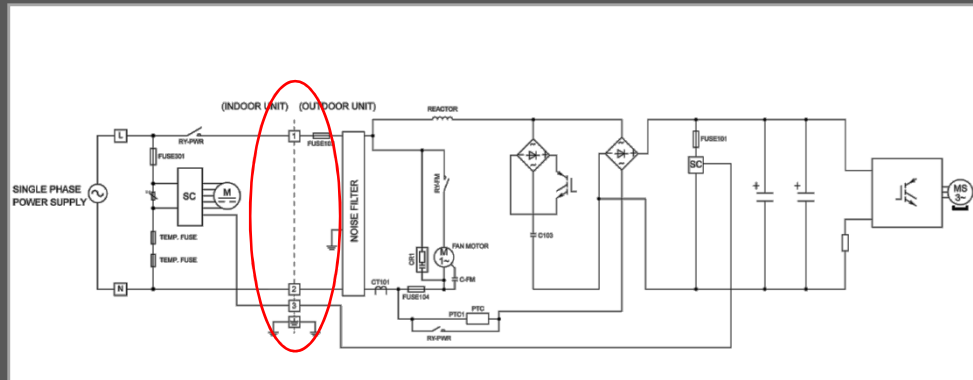
## H11 (Indoor/Outdoor Abnormal Communication)

### Failure Judgment Conditions

- H11 error code will be displayed ,when indoor / outdoor abnormal communication detected for more then 1mint after starting operation.

### Failure Root Causes (Primary location /parts to verify)

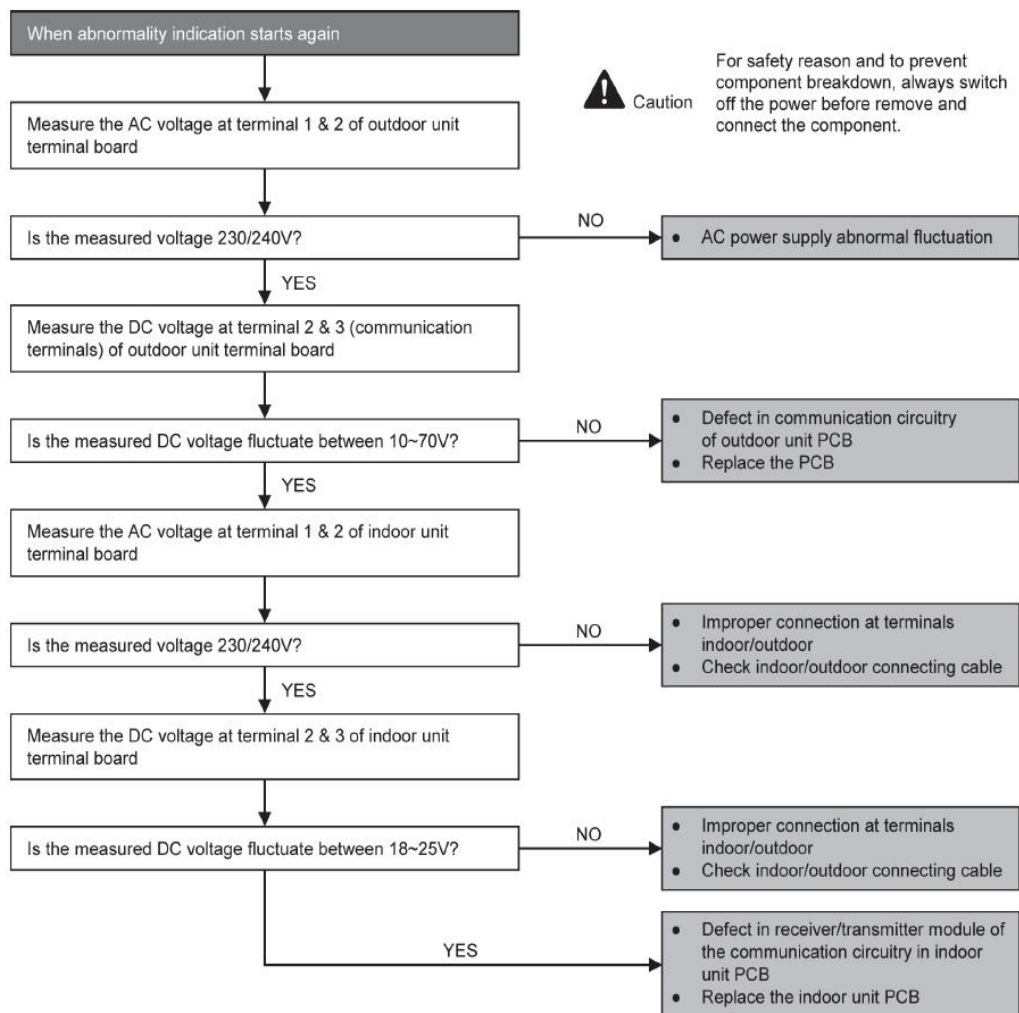
- Faulty indoor unit PCB.
- Faulty outdoor unit PCB.
- Indoor unit-outdoor unit signal transmission error due to wrong wiring.
- Indoor unit-outdoor unit signal transmission error due to breaking of wire in the connection wires between the indoor and outdoor units.
- Indoor unit-outdoor unit signal transmission error due to disturbed power supply waveform.



# Troubleshooting Guide - Inverter

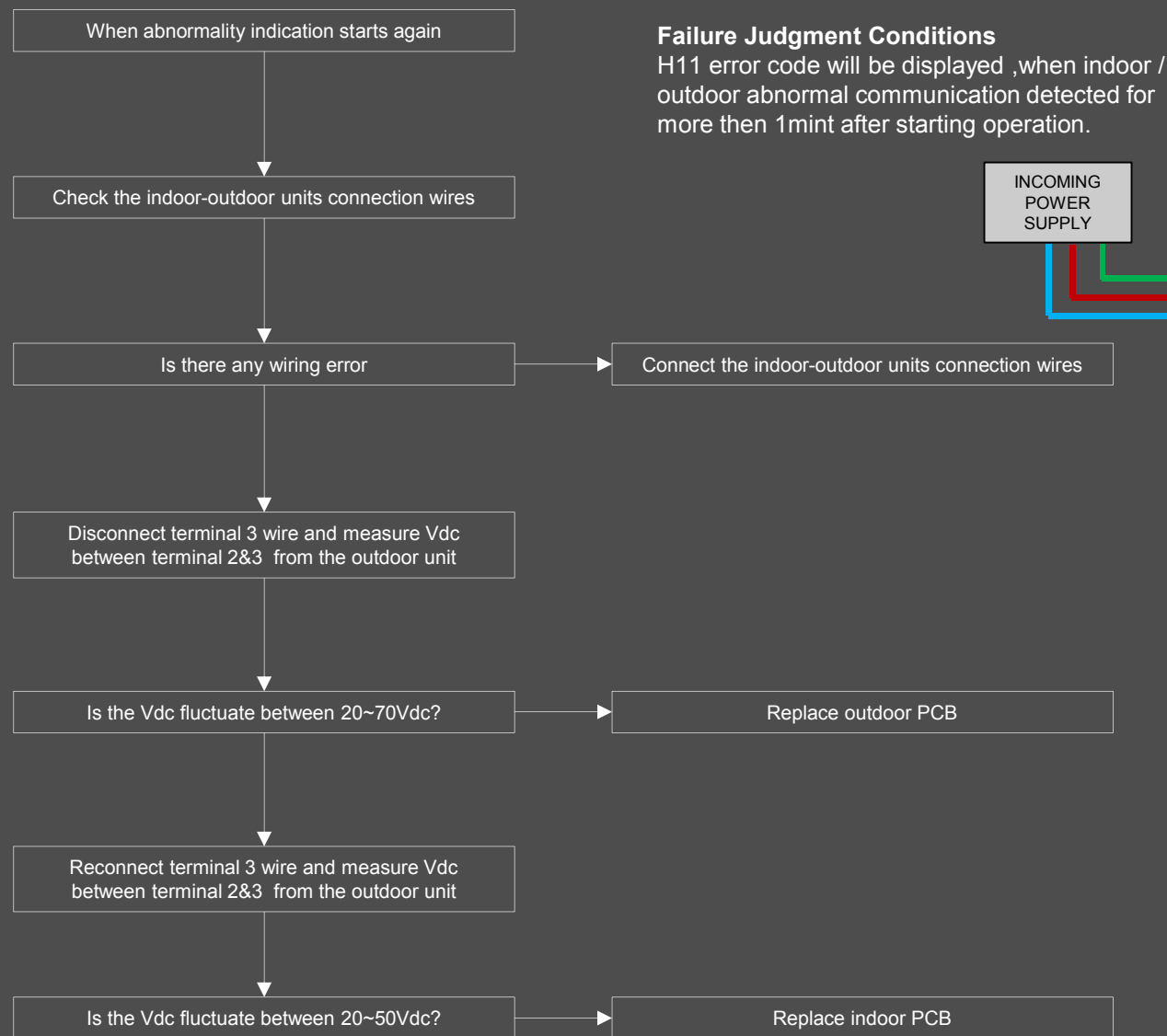
## H11 Troubleshooting Flow Chart

### Troubleshooting



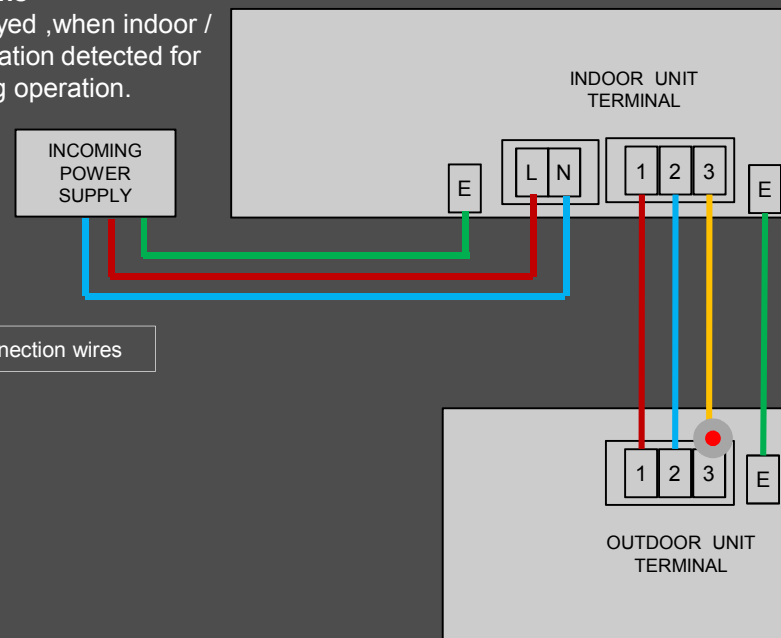
# Troubleshooting Guide - Inverter

## H11 (Indoor/Outdoor Abnormal Communication)



### Failure Judgment Conditions

H11 error code will be displayed ,when indoor / outdoor abnormal communication detected for more then 1mint after starting operation.



For safety reason and to prevent component breakdown, always switch OFF the power before remove and connect the component.

# Troubleshooting Guide - Inverter

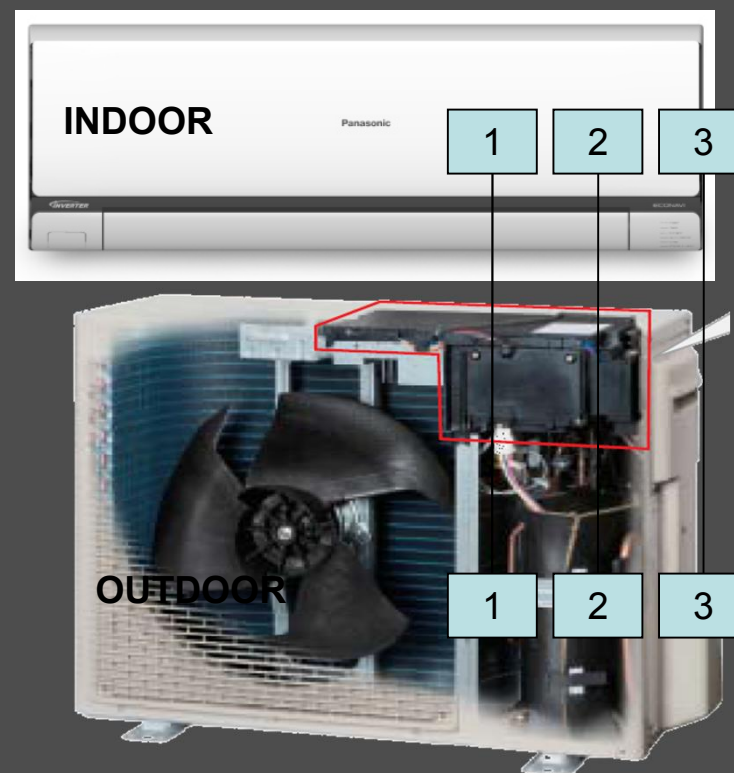
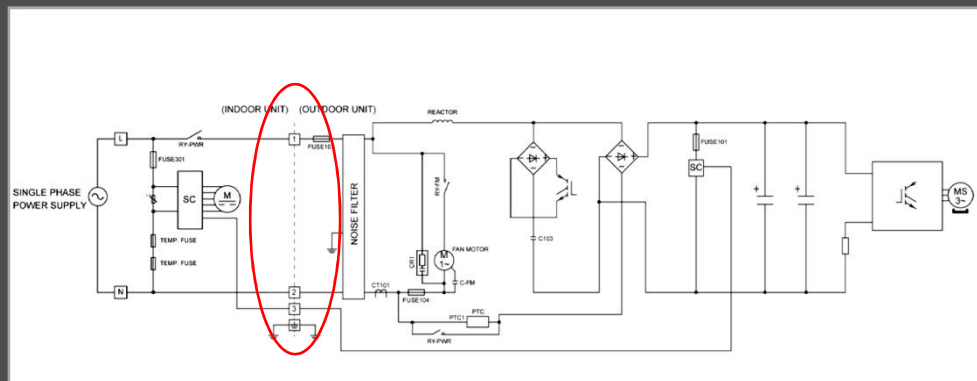
## H12 (Indoor/Outdoor Capacity Rank Mismatched)

### Failure Judgment Conditions

- H12 error code will be displayed ,when indoor / outdoor connection capacity abnormal detected continuously for 90s during startup (after power supplied).

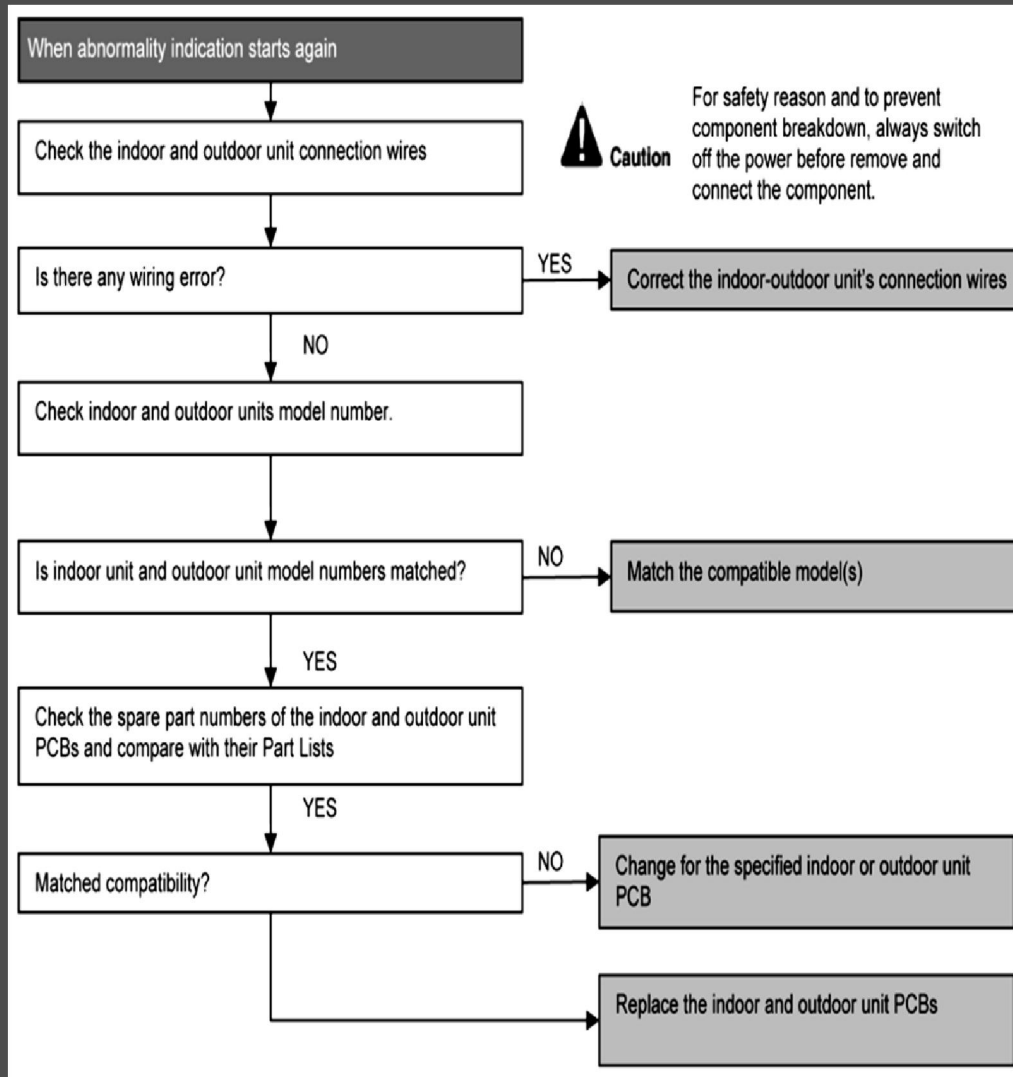
### Failure Root Causes (Primary location /parts to verify)

- Wrong models interconnected.
- Wrong indoor unit or outdoor unit PCBs mounted.
- Indoor unit or outdoor unit PCBs defective.
- Indoor-outdoor unit signal transmission error due to wrong wiring..



# Troubleshooting Guide - Inverter

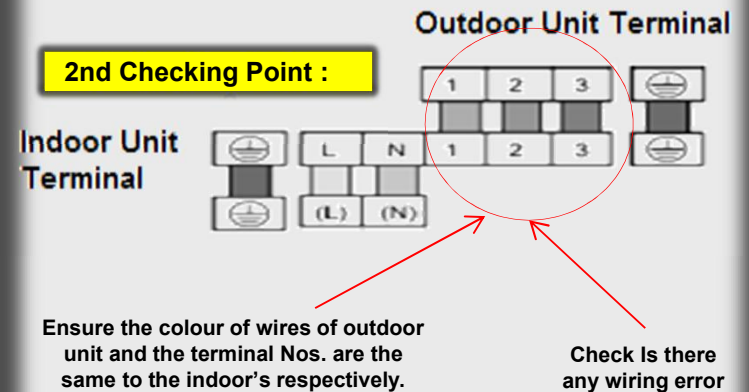
## H12 Troubleshooting Flow Chart



### 1st Checking Point :

Check the indoor-outdoor unit connection wires

### 2nd Checking Point :



### 3rd Checking Point :

Check indoor-outdoor model number

Check the indoor - outdoor PCB compatibility  
(correct part number)

# Troubleshooting Guide - Inverter

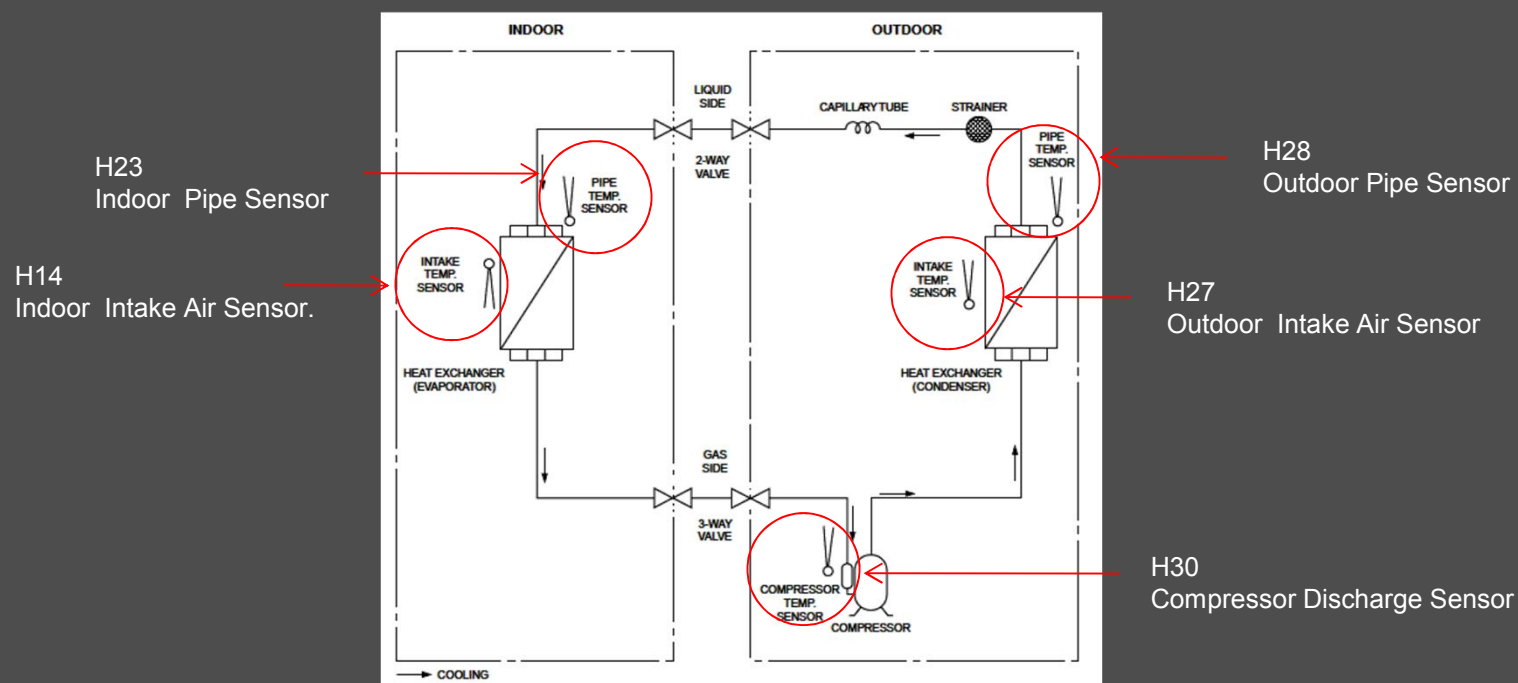
## H14 / H15 / H23 / H27 / H28 / H30 (Temperature Sensor Abnormality)

### Failure Judgment Conditions

- Error code will be displayed ,when indoor / outdoor sensor abnormality detected continues for 5 sec during operation / timer sampling.

### Failure Root Causes (Primary location /parts to verify)

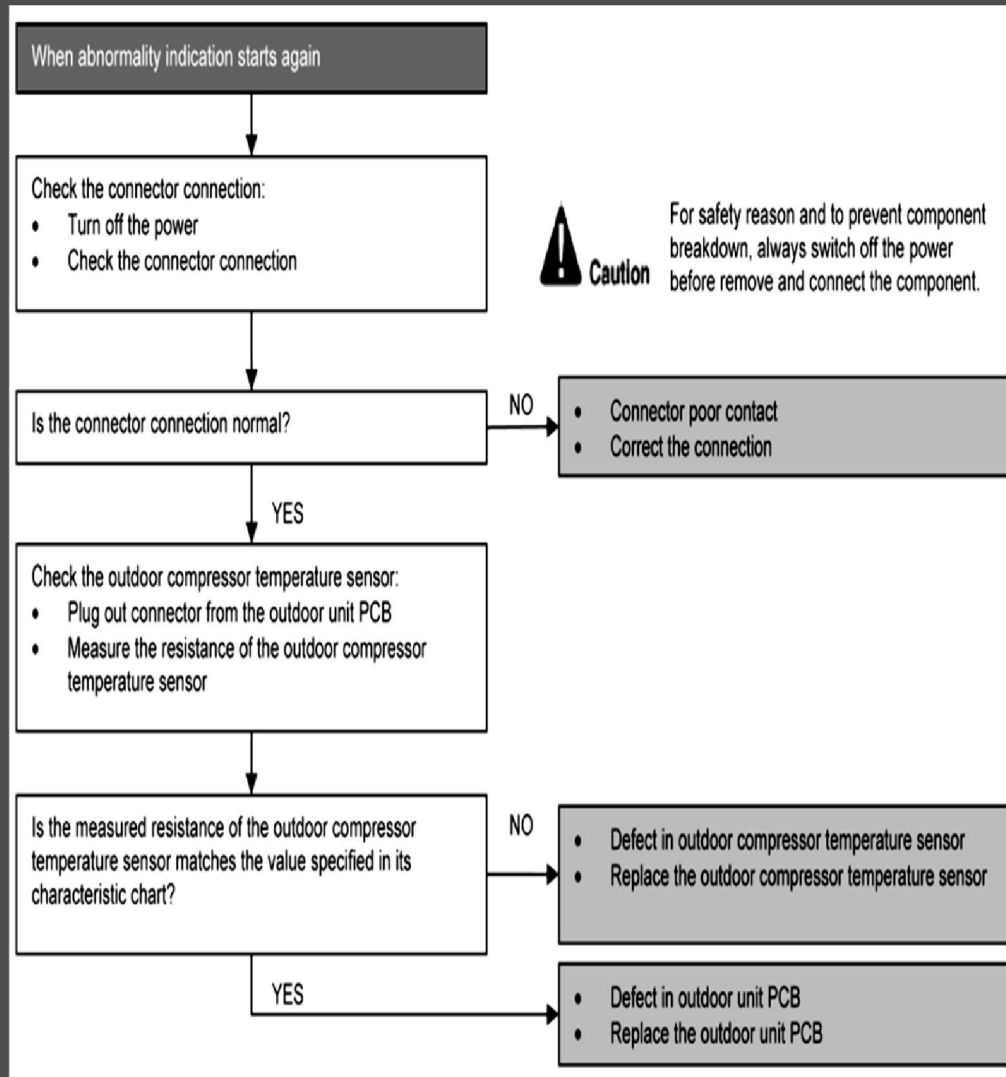
- Faulty connector connection.
- Faulty sensor.
- Faulty PCB.



# Troubleshooting Guide - Inverter

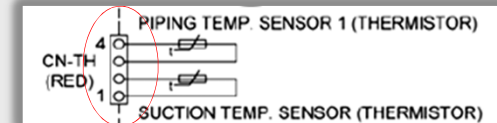
**H14 / H15 / H23 / H27 / H28 / H30**

## Sample Troubleshooting Flow Chart



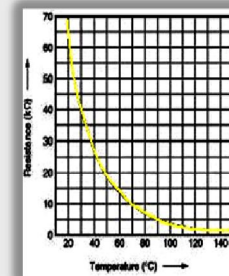
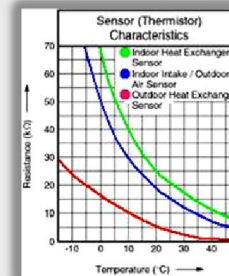
### 1st Checking Point :

Confirm sensor connector connection



### 2nd Checking Point :

Measure resistance to confirm sensor value match with characteristic chart



### 3rd Checking Point :

If above checking is no issue , then either indoor / outdoor PCB is defective



# Troubleshooting Guide - Inverter

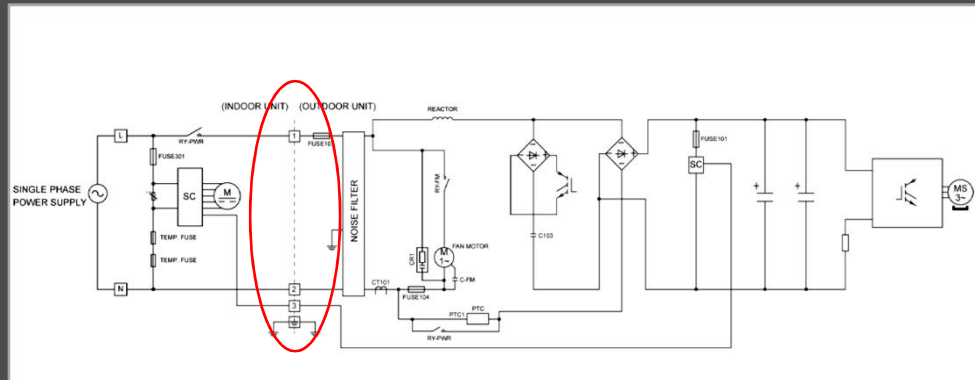
### H33 (Unspecified Voltage between Indoor and Outdoor )

## Failure Judgment Conditions

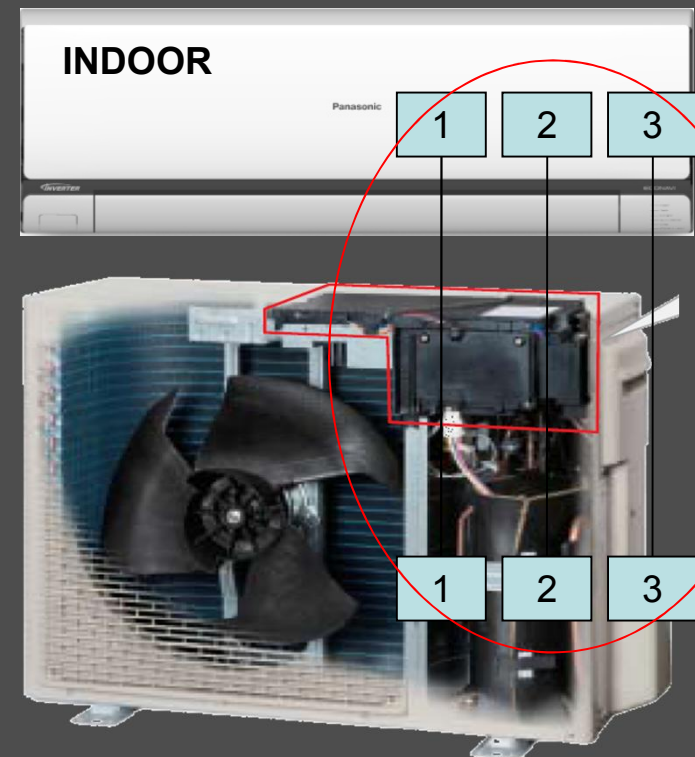
- H33 error code will be displayed ,when abnormal voltage detected between indoor / outdoor transmission.

### Failure Root Causes (Primary location /parts to verify)

- Wrong models interconnected.
- Wrong indoor unit and outdoor unit PCBs used.
- Indoor unit or outdoor unit PCB defective.



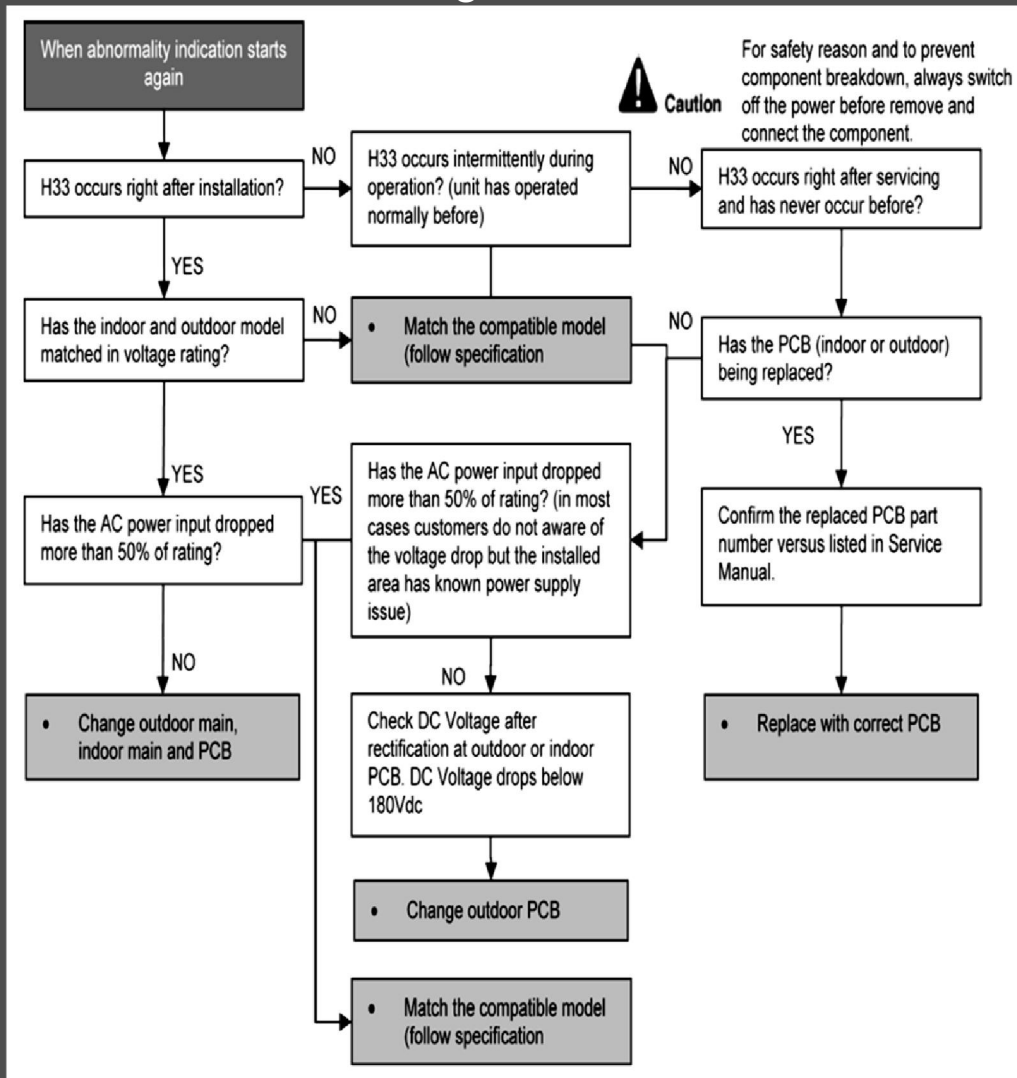
## OUTDOOR



# Panasonic

# Troubleshooting Guide - Inverter

## H33 Troubleshooting Flow Chart



### 1st Checking Point :

Check the indoor-outdoor voltage rating matched

### 2nd Checking Point :

Check AC power input dropped more than 50% of rating

### 3rd Checking Point :

Check DC Voltage after rectification circuit at outdoor or indoor PCB. DC voltage drops below 180VDC.

# Troubleshooting Guide - Inverter

## H19 (Indoor Fan Motor – DC Motor Mechanism Locked)

### Failure Judgment Conditions

- Error code will be displayed ,when indoor fan motor RPM detected abnormal continuously for 7 times.  
(feedback RPM detected <50rpm or >2550rpm).

Happened after 7 times of fan motor stop & restart.

If the PCB detected the fan motor feedback voltage is out of the normal range for 5 sec, the fan motor will stop and restart back after 25sec.

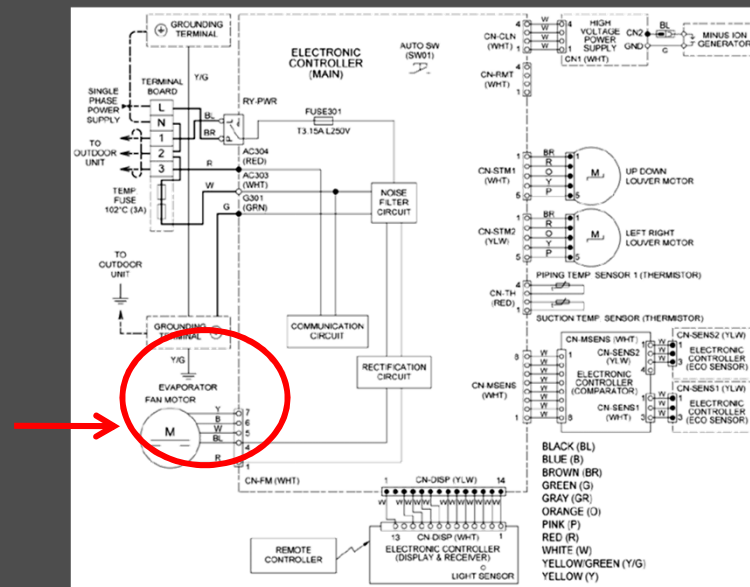
### Failure Root Causes (Primary location /parts to verify)

- Operation stops due to short circuit inside the fan motor winding.
- Operation stops due to breaking of wire inside the fan motor.
- Operation stops due to breaking of fan motor lead wires.
- Operation stops due to Hall IC malfunction.
- Operation error due to faulty indoor unit PCB.



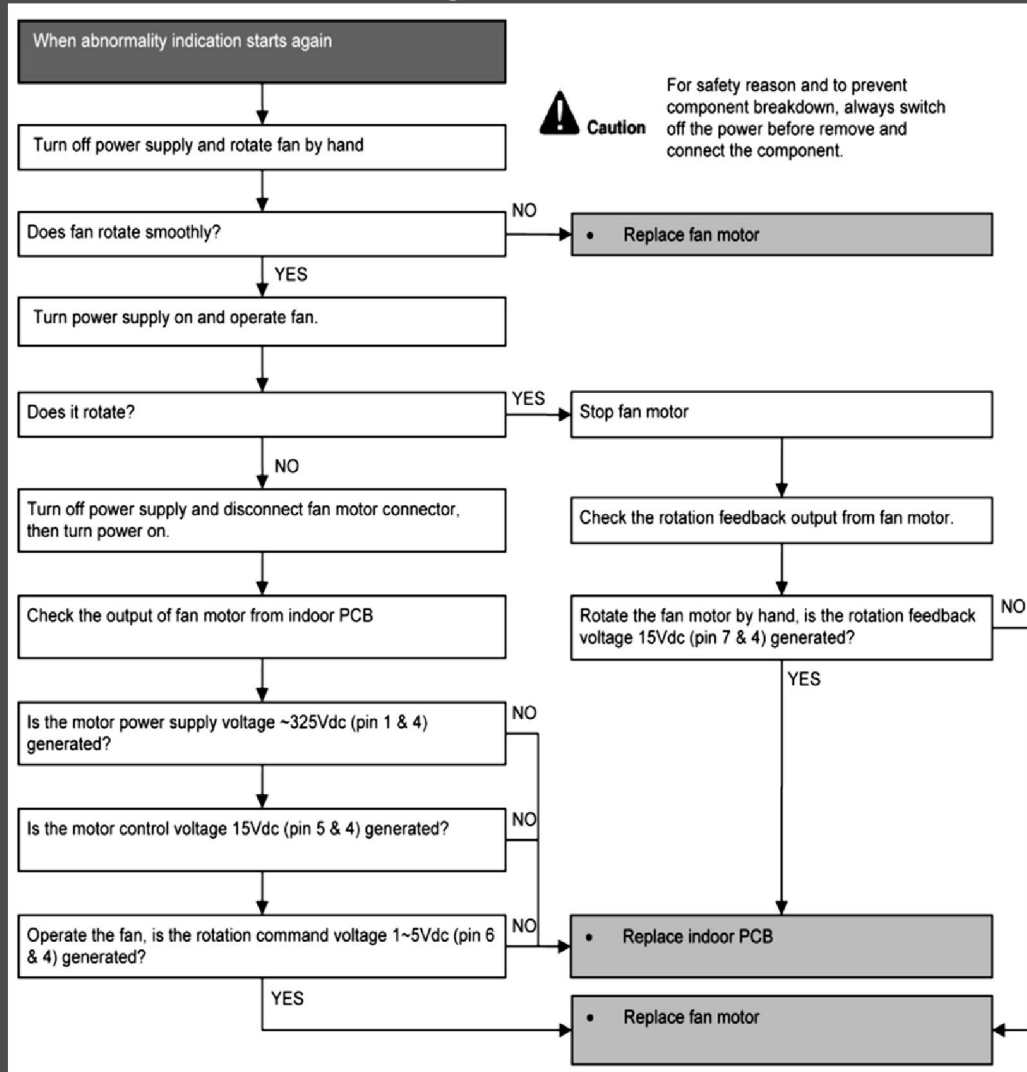
1	RED	Vdc
2	-	-
3	-	-
4	BLACK	Gnd
5	WHITE	Vcc
6	BLUE	FG
7	YELLOW	Vap

Indoor fan Motor



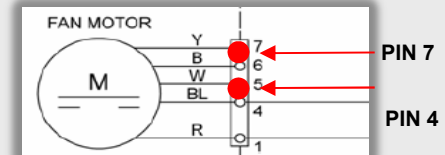
# Troubleshooting Guide - Inverter

## H19 Troubleshooting Flow Chart



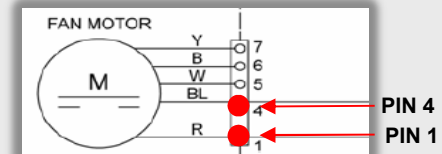
### 1st Checking Point :

Check rotation feedback output from fan motor 15 Vdc generated (pin 7&4)



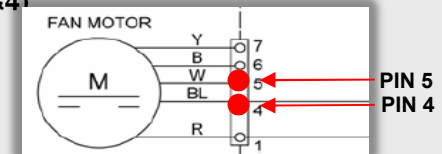
### 2nd Checking Point :

Check the motor power supply voltage ~325 Vdc generated (pin 1 & 4)



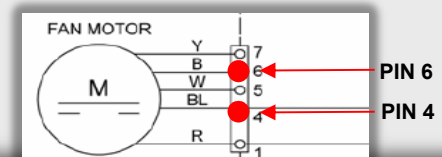
### 3rd Checking Point :

Check motor control voltage 15Vdc generated (pin 5 & 4)



### 4th Checking Point :

Check the rotation command voltage 1~5 Vdc generated (pin 6 & 4)



# Troubleshooting Guide - Inverter

## H16 (Outdoor Current Transformer Open Circuit)

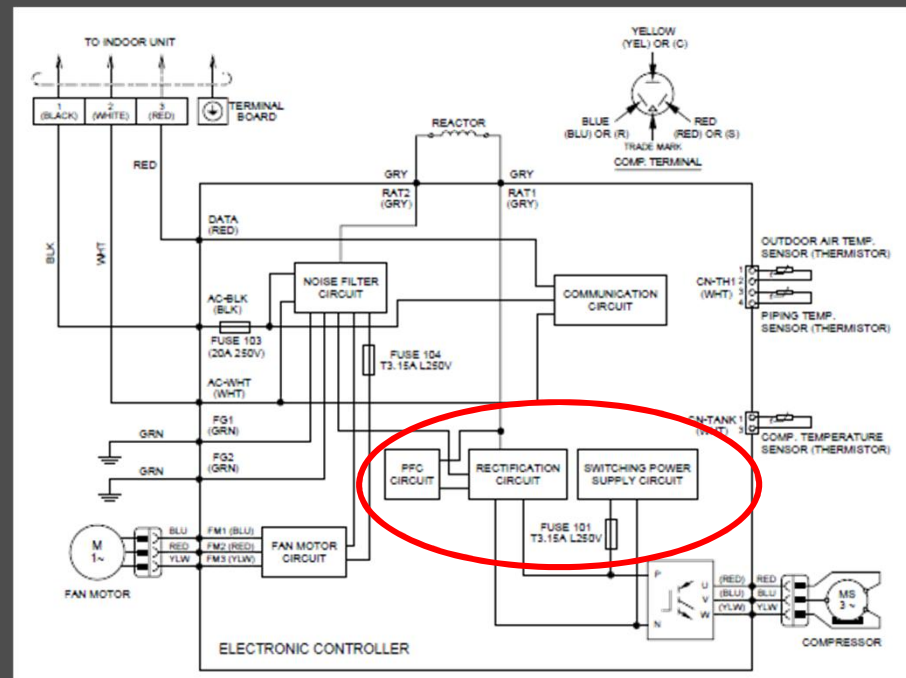
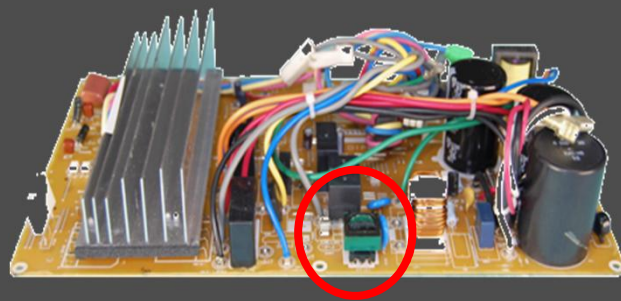
### Failure Judgment Conditions

Error code will be displayed ,when current transformer (CT) at the outdoor PCB detect the compressor running frequency ( $\geq$  rated Freq) and input current less than 1.5A for continuous 20 sec.

- Compressor will stop operation. Then, operation will restart after 3minute.
- If this condition repeats continuously for 4 times, timer LED will be blinking (“H16” is indicated).

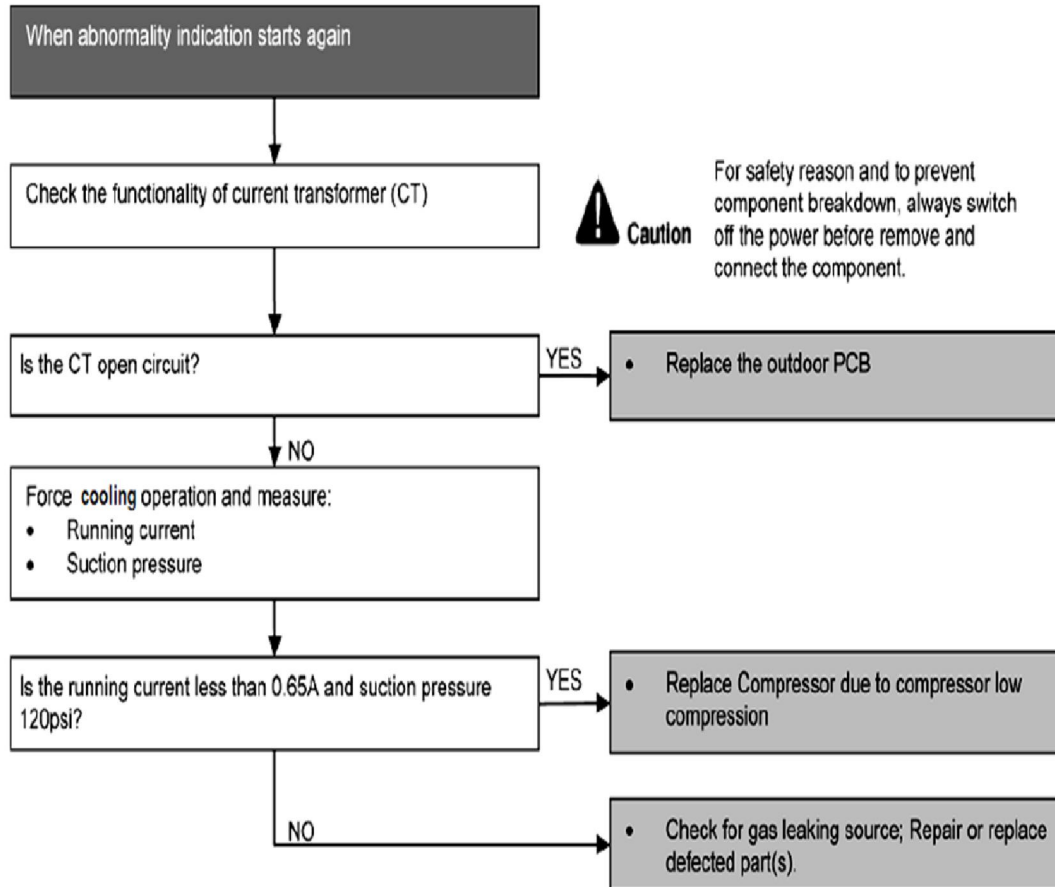
### Failure Root Causes (Primary location /parts to verify)

- CT defective
- Outdoor PCB defective
- Compressor defective (low compression)



# Troubleshooting Guide - Inverter

## H16 Troubleshooting Flow Chart

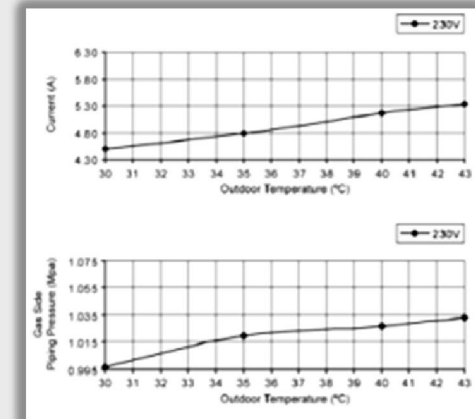


### 1st Checking Point :

Check the functionality of current transformer

### 2nd Checking Point :

Check the temp vs current and pressure graph in force cooling



### 3rd Checking Point :

Check for gas leaking or capillary/ expansion valve block



# Troubleshooting Guide - Inverter

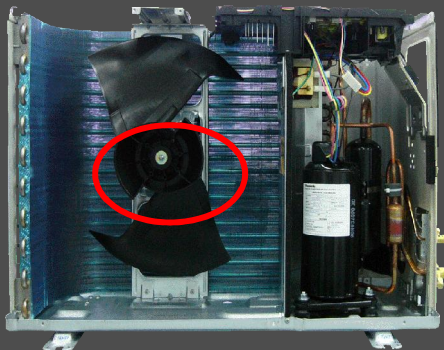
## H97 (Outdoor Fan Motor – DC Motor Mechanism Locked)

### Failure Judgment Conditions

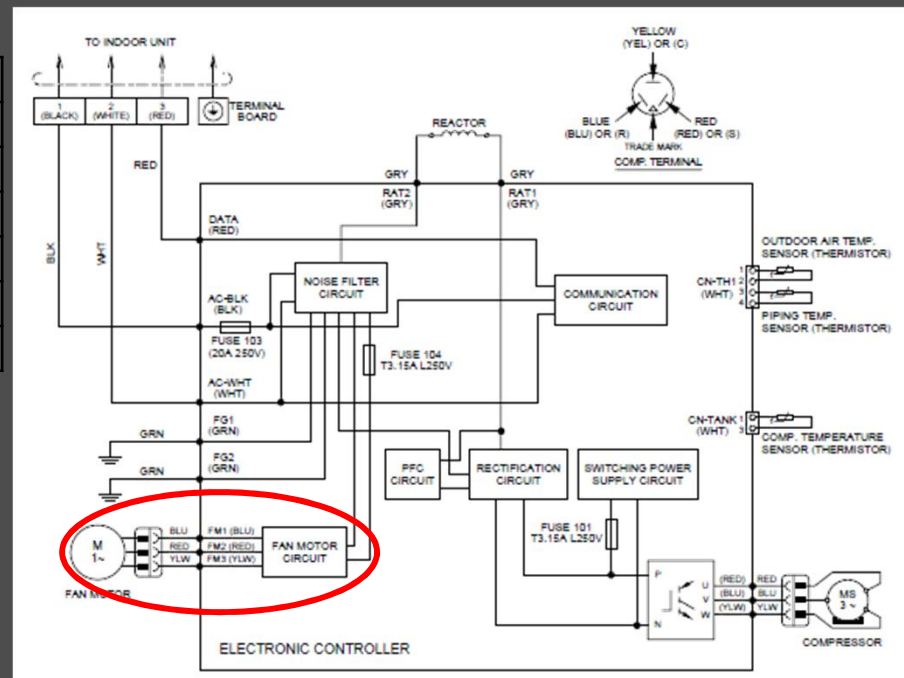
- Error code will be displayed ,when indoor fan motor RPM detected abnormal for 2 times in 20 minutes. (feedback RPM detected <20rpm or >2550rpm).
- If the PCB detected the fan motor feedback voltage is out of the normal range for 10 sec, the fan motor OFF, compressor STOP and restart back after 3 min.

### Failure Root Causes (Primary location /parts to verify)

- Operation stops due to short circuit inside the fan motor winding.
- Operation stops due to breaking of wire inside the fan motor.
- Operation stops due to breaking of fan motor lead wires.
- Operation stops due to Hall IC malfunction.
- Operation error due to faulty outdoor unit PCB.

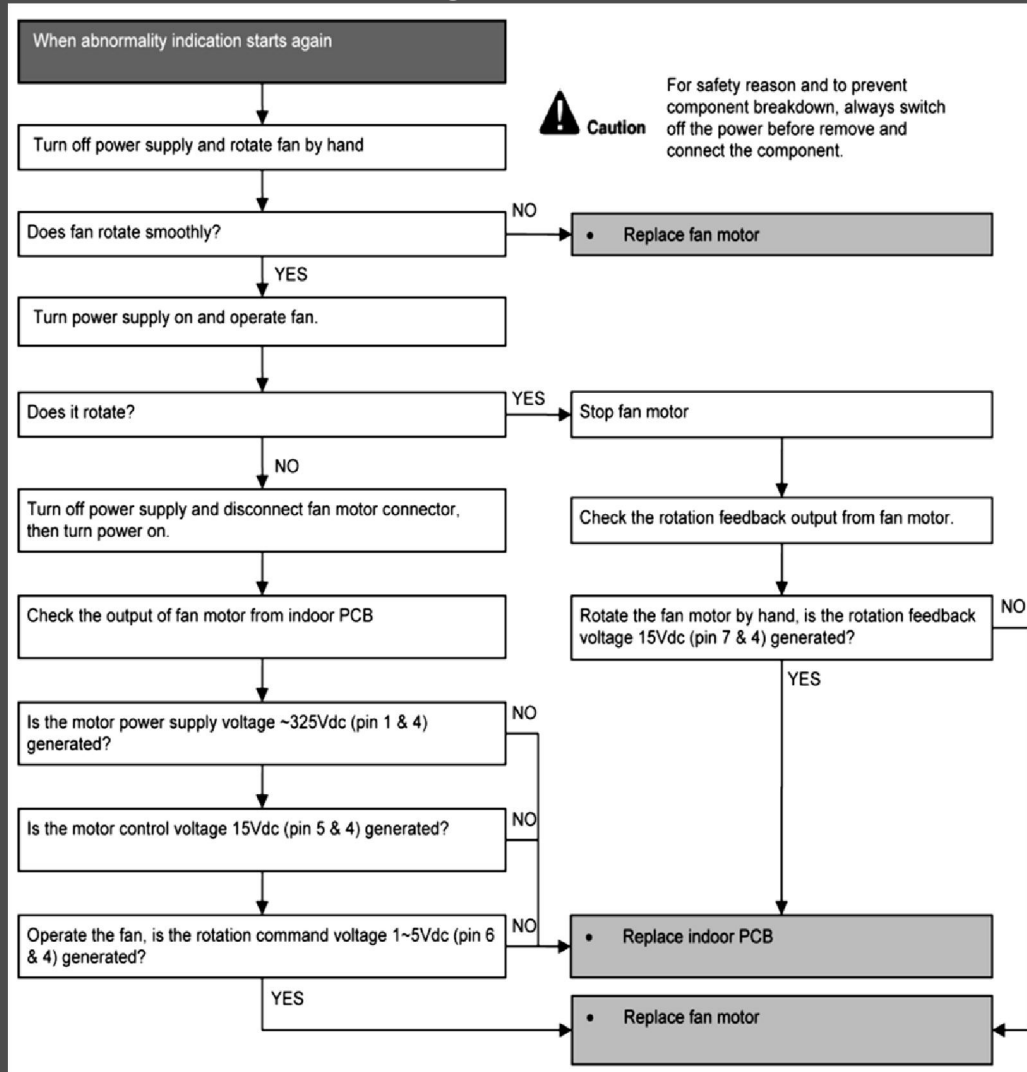


1	RED	Vdc
2	-	-
3	-	-
4	BLACK	Gnd
5	WHITE	Vcc
6	BLUE	FG
7	YELLOW	Vap



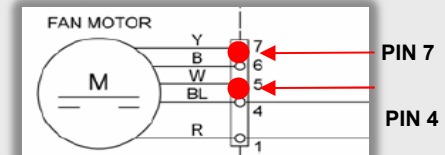
# Troubleshooting Guide - Inverter

## H97 Troubleshooting Flow Chart



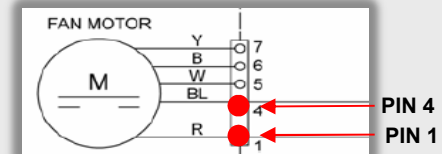
### 1st Checking Point :

Check rotation feedback output from fan motor 15 Vdc generated (pin 7&4)



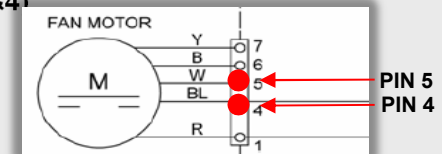
### 2nd Checking Point :

Check the motor power supply voltage ~325 Vdc generated (pin 1 & 4)



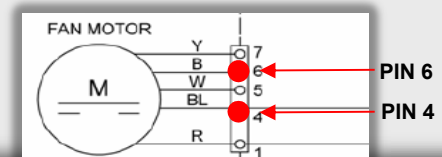
### 3rd Checking Point :

Check motor control voltage 15Vdc generated (pin 5 & 4)



### 4th Checking Point :

Check the rotation command voltage 1~5 Vdc generated (pin 6 & 4)





# Troubleshooting Guide - Inverter

## H98 (Indoor High Pressure Protection)

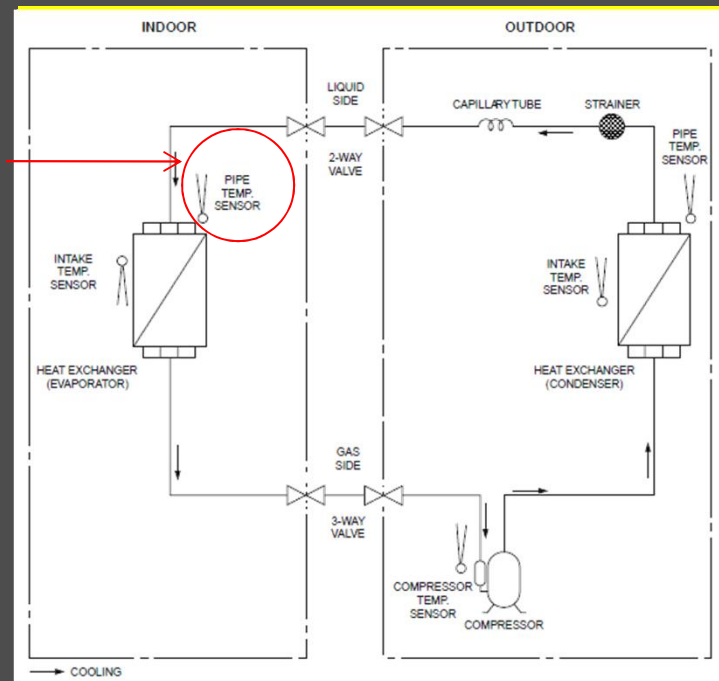
### Failure Judgment Conditions

The temperature detected by the indoor pipe temperature sensor is abnormal.  
**Error Code will not display (no Timer LED blinking) but store in EEPROM.**

### Failure Root Causes (Primary location /parts to verify)

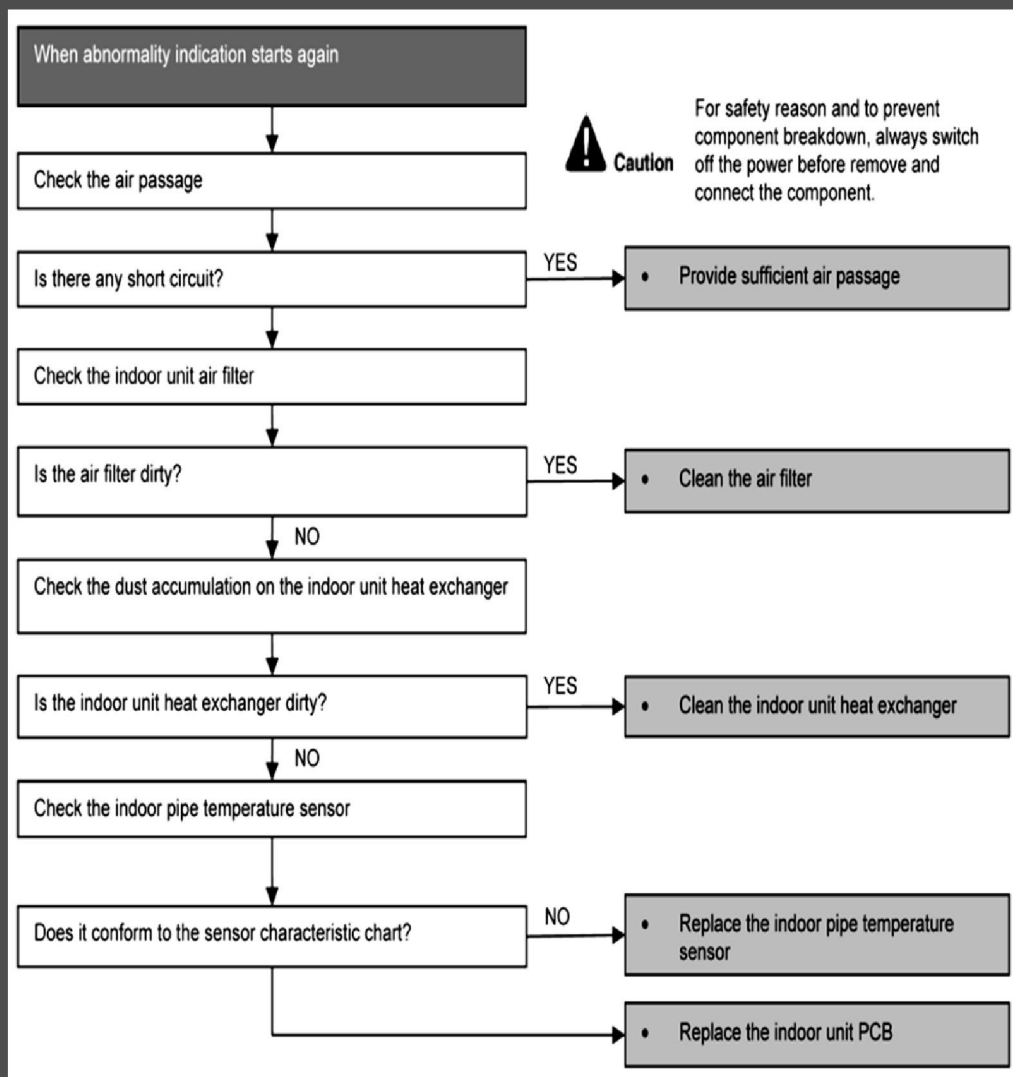
- Clogged air filter of the indoor unit
- Dust accumulation on the indoor unit heat exchanger
- Air short circuit
- Detection error due to faulty indoor pipe temperature sensor
- Detection error due to faulty indoor unit PCB

Indoor Pipe Sensor



# Troubleshooting Guide - Inverter

## H98 Troubleshooting Flow Chart



### 1st Checking Point :

Check is there any short cycling of air

### 2nd Checking Point :

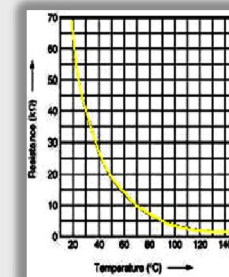
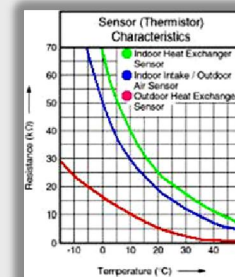
Check is the air filter dirty

### 3rd Checking Point :

Check is the indoor heat exchanger is dirty

### 4th Checking Point :

Measure indoor pipe temp sensor resistance to confirm sensor value match with characteristic chart



# Troubleshooting Guide - Inverter

## F11 (Indoor Pipe Temperature Sensor Abnormality) -Cooling Model

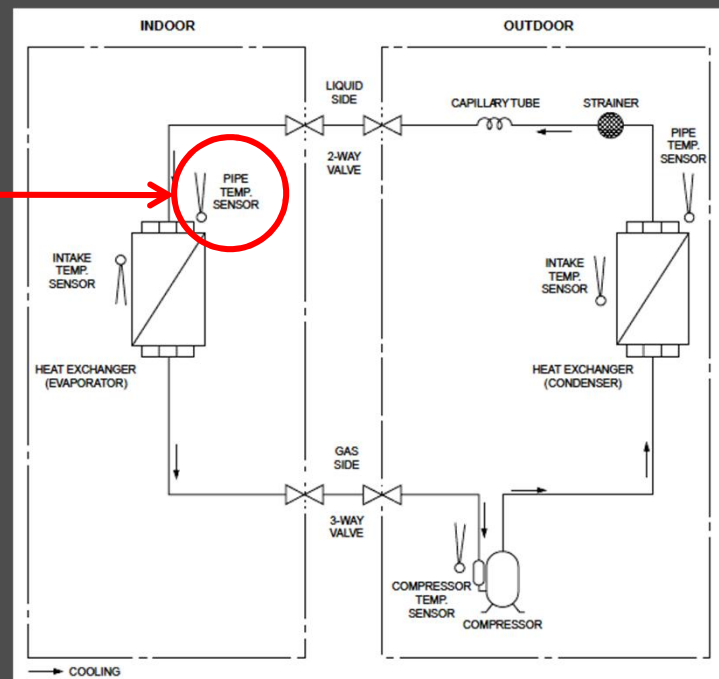
### Failure Judgment Conditions

When cooling operation, when indoor pipe temperature or indoor heat exchanger temperature sensor is above 45°C.

### Failure Root Causes (Primary location /parts to verify)

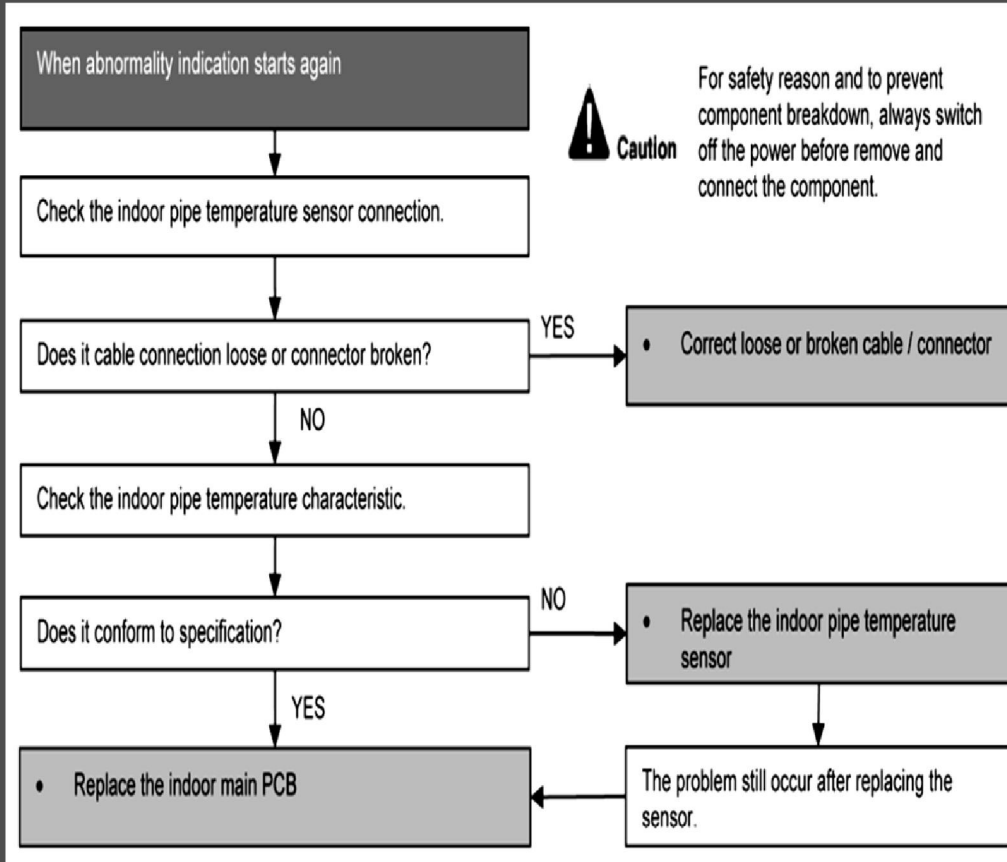
- Faulty connector connection.
- Faulty indoor pipe temperature sensor.
- Faulty indoor main PCB.

Indoor Pipe Sensor



# Troubleshooting Guide - Inverter

## F11 Troubleshooting Flow Chart



### 1st Checking Point :

Check is the cable connection loosed or connector broken

### 2nd Checking Point :

Check is indoor pipe tem sensor characteristic valve

### 3rd Checking Point :

Check the indoor main PCB

# Troubleshooting Guide - Inverter

## F90 (Power Factor Correction Protection)

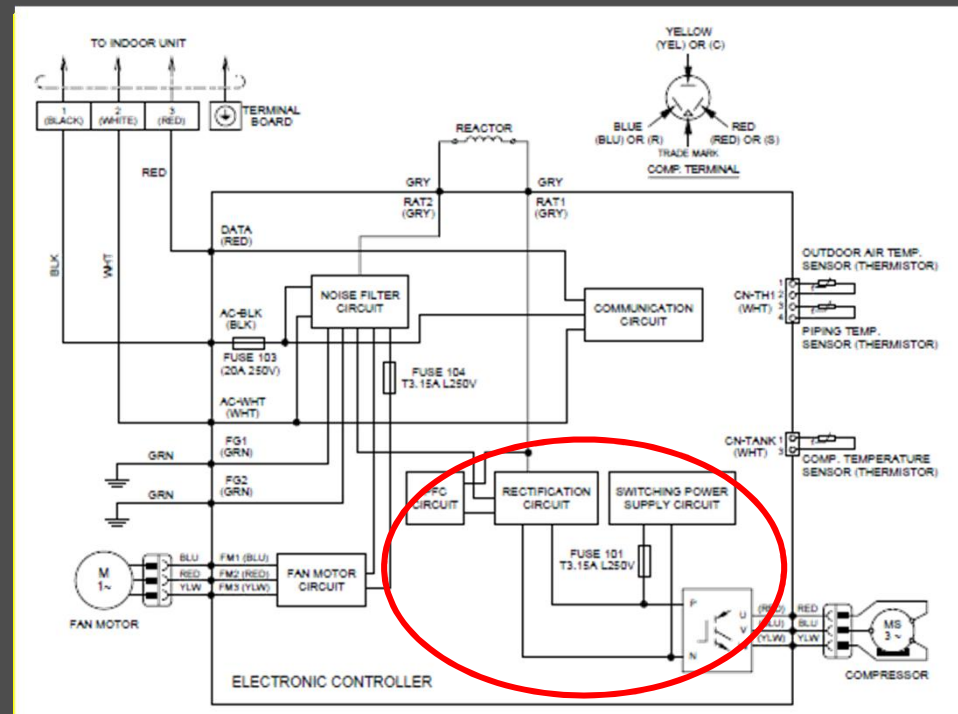
### Failure Judgment Conditions

Error code will be displayed ,when outdoor PCB detect DC overvoltage above 340VDC for continues 4times in 20 mints.

### Failure Root Causes (Primary location /parts to verify)

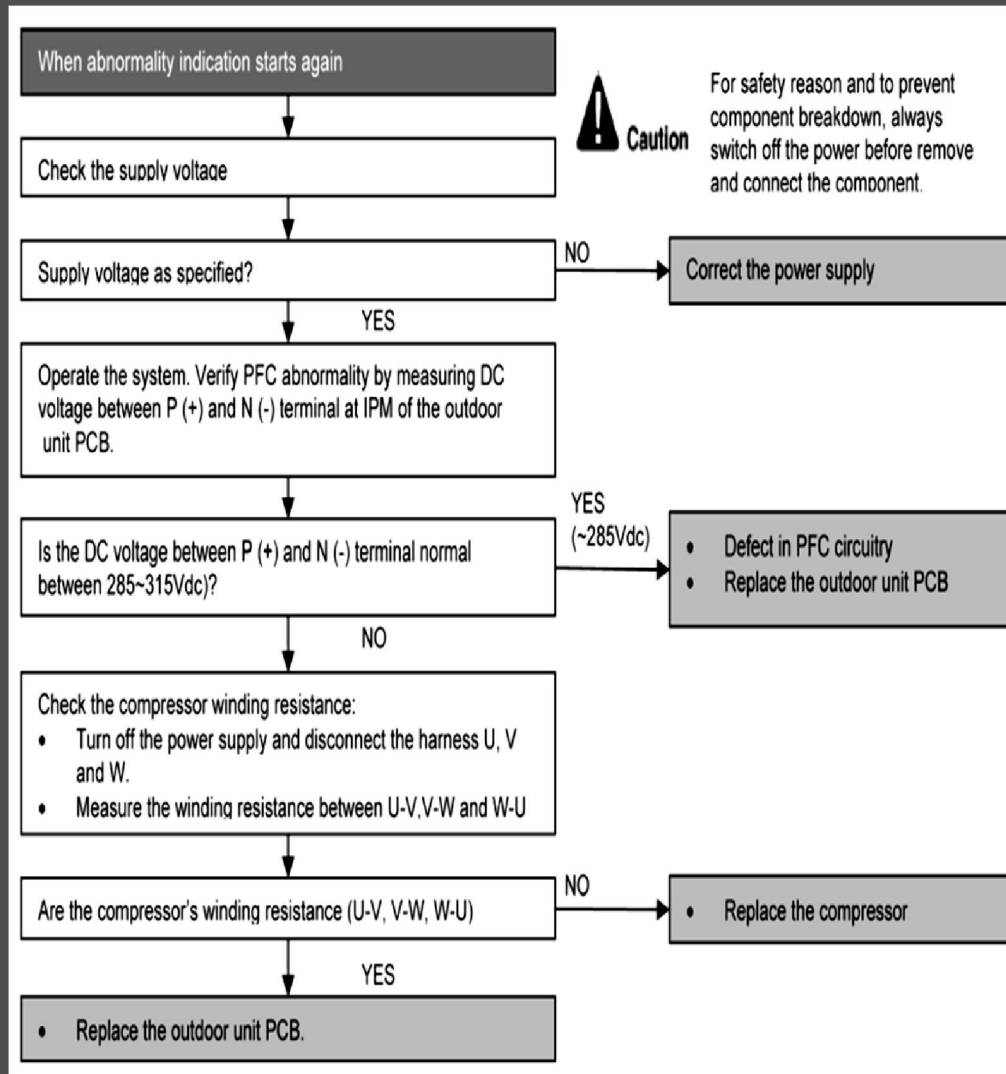
- DC voltage peak due to power supply surge.
- DC voltage peak due to compressor windings not uniform.
- Faulty outdoor PCB.

During operation, when PFC (Power Factor Correction) protection circuitry at the outdoor PCB detected abnormal high DC voltage.



# Troubleshooting Guide - Inverter

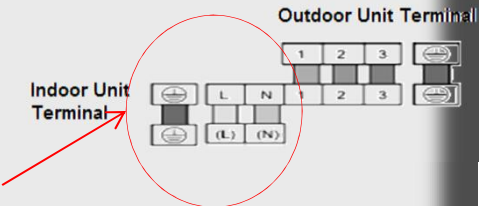
## F90 Troubleshooting Flow Chart



### 1st Checking Point :

Check the power supply voltage

Check supply voltage as specified



### 2nd Checking Point :

Check the DC voltage between P(+) and N(-) terminal

### 3rd Checking Point :

Check the compressor winding resistance U,V and W

Sample:

Resistance of Compressor Windings	
MODEL	CU-S18PK
CONNECTION	5RD132XGA21
U-V	1.276Ω
U-W	1.276Ω
V-W	1.276Ω

Note: Resistance at 20°C of ambient temperature.

# Troubleshooting Guide - Inverter

## F91 (Refrigeration Cycle Abnormality)

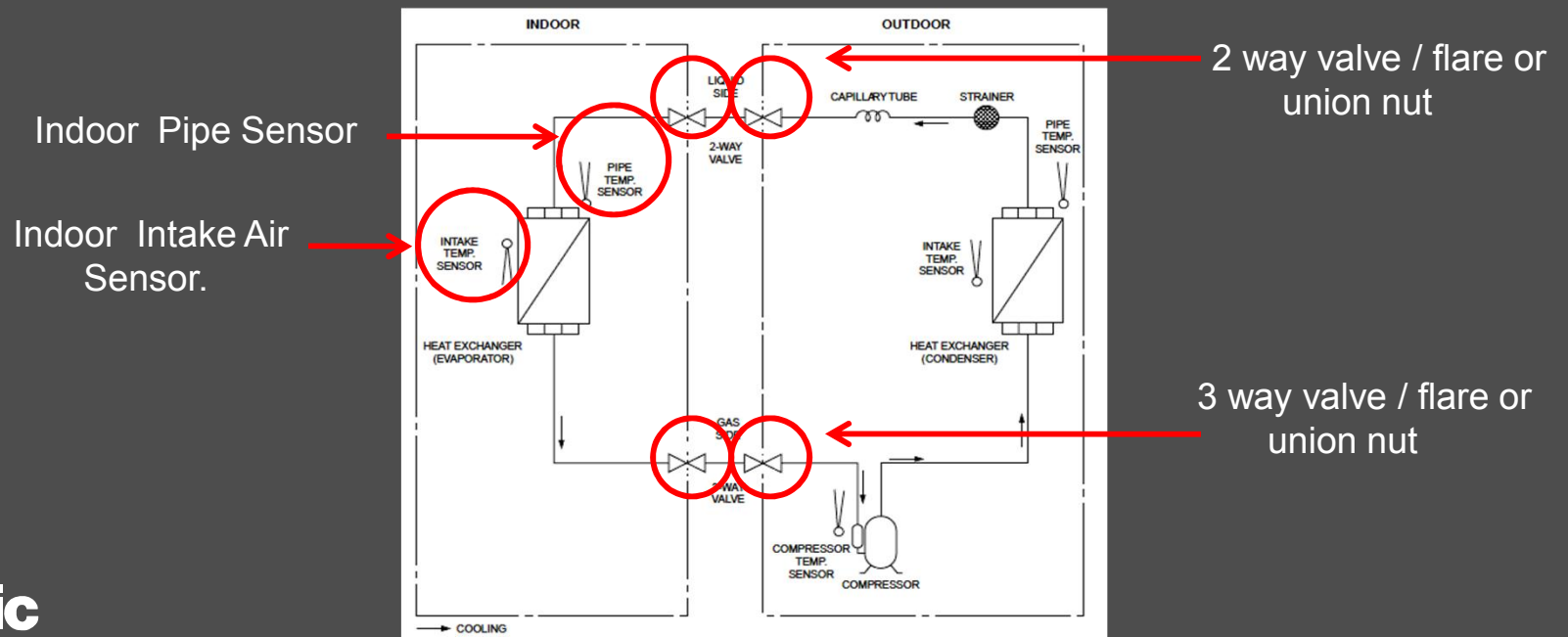
### Failure Judgment Conditions

Error code will be displayed ,when during cooling, compressor frequency = F<sub>cmax</sub> and during heating, compressor frequency > F<sub>h</sub> rated

- Cooling and heating operation, running current:  $0.65A < I < 1.65A$ .
- Cooling, indoor intake - indoor pipe < 4°C.
- Cooling, indoor pipe - indoor intake < 5°C.
- If this condition repeats continuously for 2 times within 20 mints, timer LED will be blinking (“F91” is indicated).

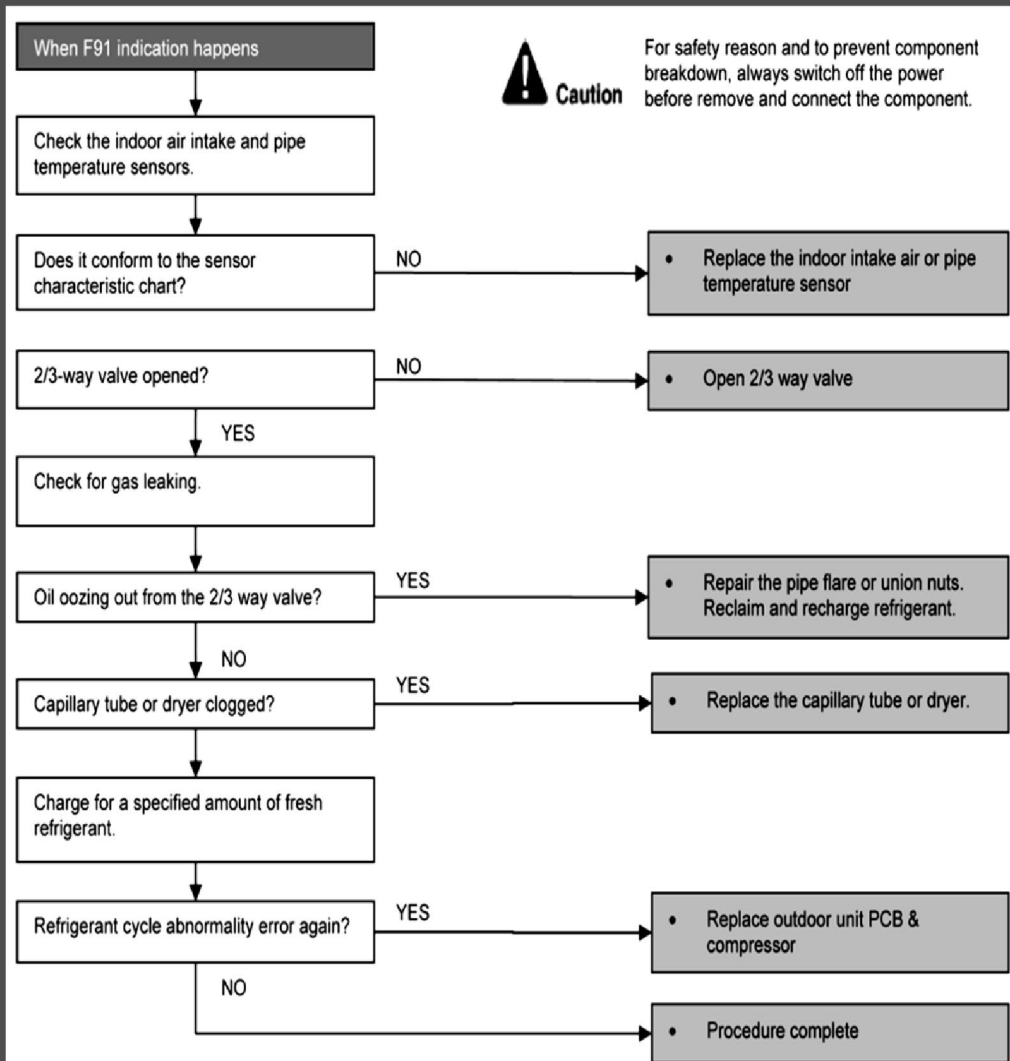
### Failure Root Causes (Primary location /parts to verify)

- Detection error due to faulty indoor intake air or indoor pipe temperature sensors
- 2/3 way valve closed.
- Refrigerant shortage (refrigerant leakage)
- Poor compression performance of compressor..



# Troubleshooting Guide - Inverter

## F91 Troubleshooting Flow Chart



### 1st Checking Point :

Check the indoor air intake and pipe temperature with sensor characteristic chart

### 2nd Checking Point :

Check the 2way and 3 way valve open, gas leak , oil oozing out from valve.

### 3rd Checking Point :

Check is capillary tube clogged

### 4th Checking Point :

Change for a specified amount of fresh refrigerant

### 4th Checking Point :

Check outdoor PCB & Compressor



# Troubleshooting Guide - Inverter

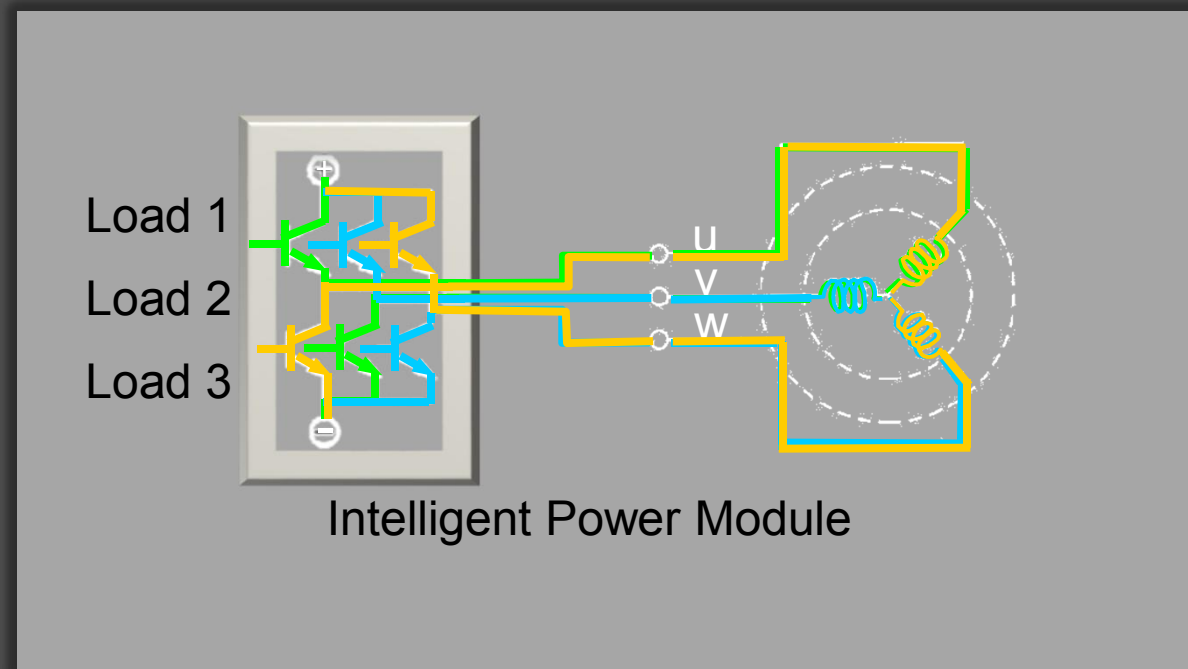
## F93 (Compressor Rotation Failure)

### Failure Judgment Conditions

A compressor rotation failure is detected by checking the compressor running condition through the position detection circuit.

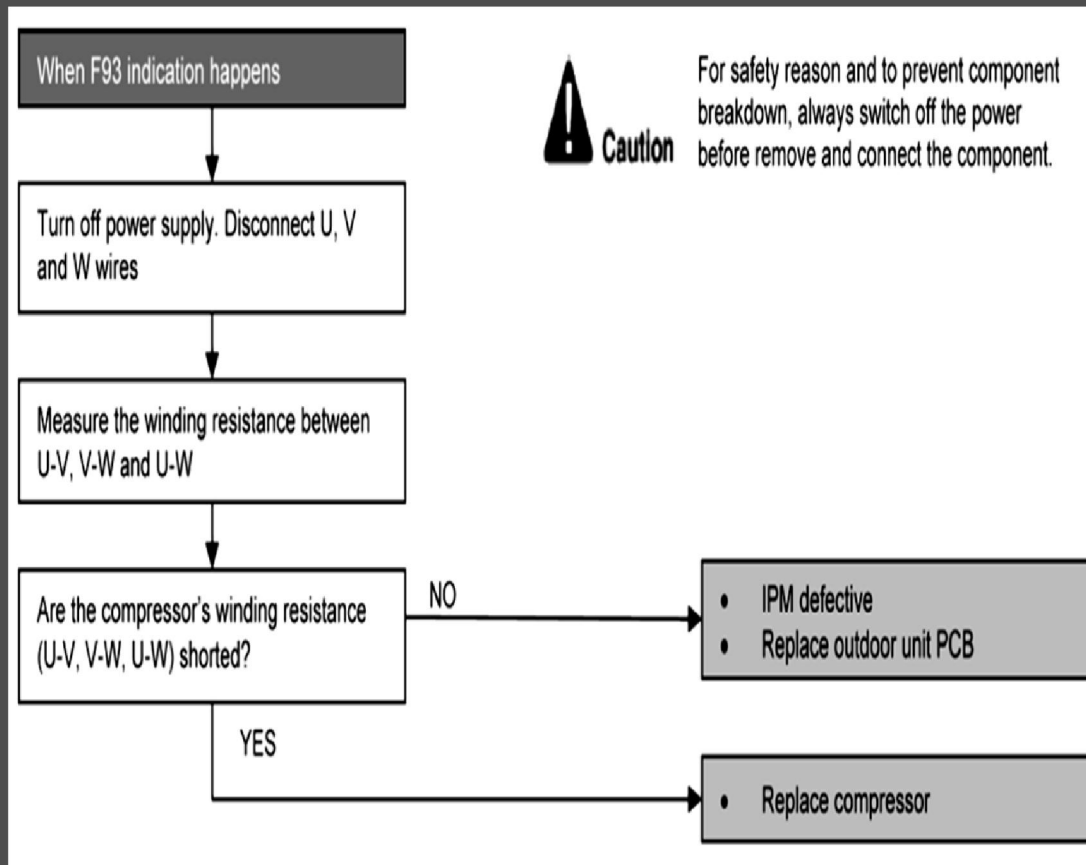
### Failure Root Causes (Primary location /parts to verify)

- Compressor terminal disconnect
- Outdoor PCB malfunction



# Troubleshooting Guide - Inverter

## F93 Troubleshooting Flow Chart



### 1st Checking Point :

Check the compressor winding resistance U,V and W

Resistance of Compressor Windings

MODEL	CU-S18PK
CONNECTION	5RD132XGA21
U-V	1.276Ω
U-W	1.276Ω
V-W	1.276Ω

Note: Resistance at 20°C of ambient temperature.

### 2nd Checking Point :

If above checking is no issue , then outdoor PCB is defective

# Troubleshooting Guide - Inverter

## F95 (Cooling High Pressure Abnormality)

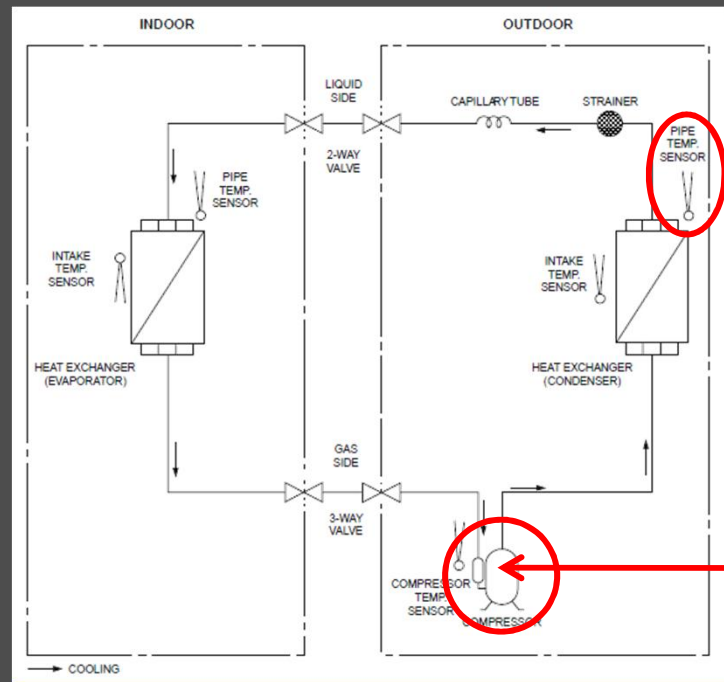
### Failure Judgment Conditions

Error code will be displayed ,when condenser temperature detected high (61 Deg C) by the outdoor condenser pipe temperature sensor.

•If this condition repeats continuously for 4 times in 20 mints, timer LED will be blinking (“F95” is indicated).

### Failure Root Causes (Primary location /parts to verify)

- Outdoor pipe temperature rise due to short circuit of hot discharge air flow.
- Outdoor pipe temperature rise due to defective of outdoor fan motor.
- Outdoor pipe temperature rise due to defective outdoor pipe temperature sensor.
- Outdoor pipe temperature rise due to defective outdoor unit PCB.

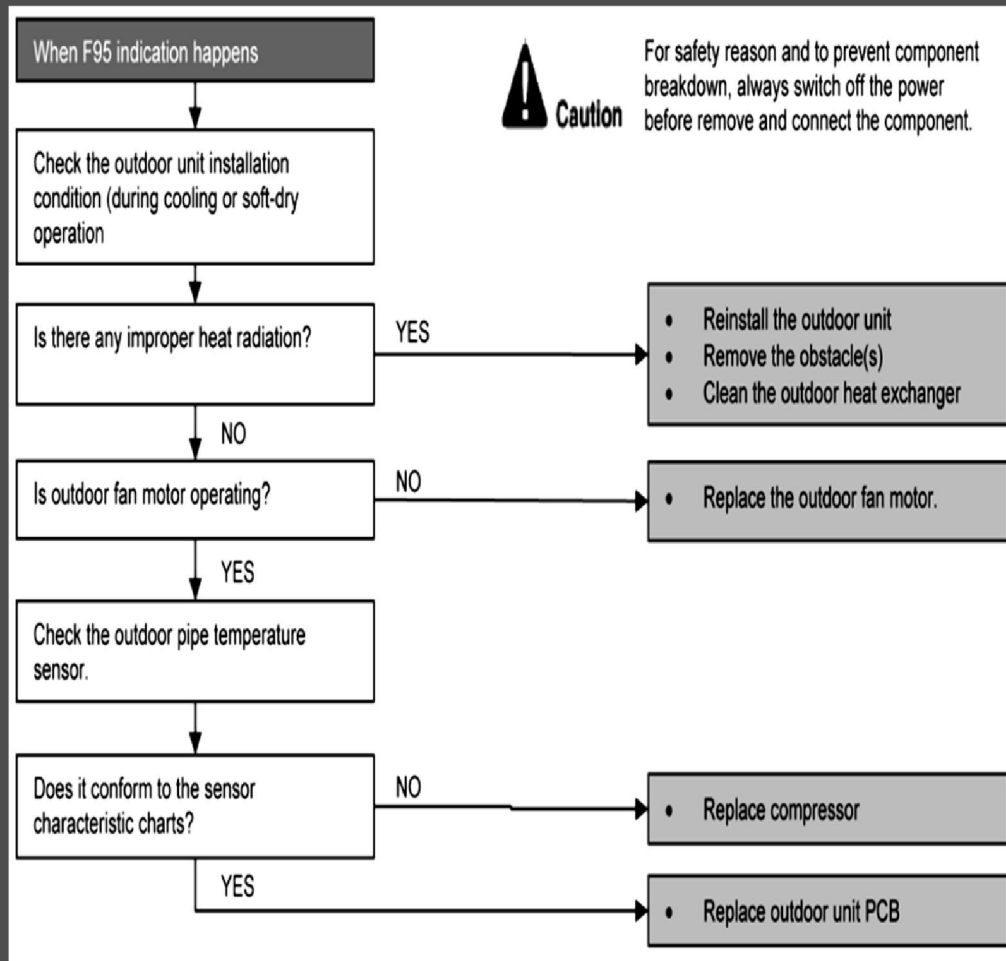


Outdoor Pipe Sensor

Compressor

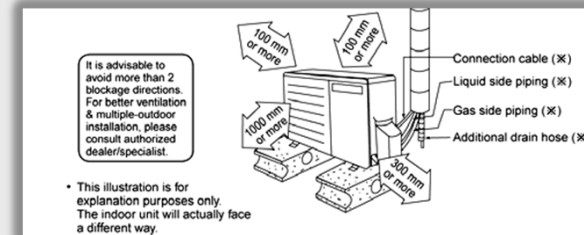
# Troubleshooting Guide - Inverter

## F95 Troubleshooting Flow Chart



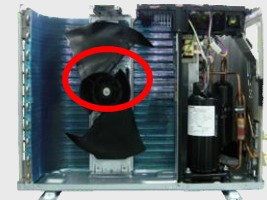
### 1st Checking Point :

Check the outdoor unit installation condition for any heat radiation



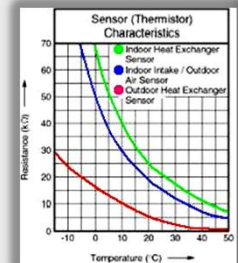
### 2nd Checking Point :

Check the outdoor motor operation



### 3rd Checking Point :

Check the outdoor pipe temperature sensor



### 4th Checking Point :

Check outdoor PCB & Compressor

# Troubleshooting Guide - Inverter

## F96 (IPM Overheating)

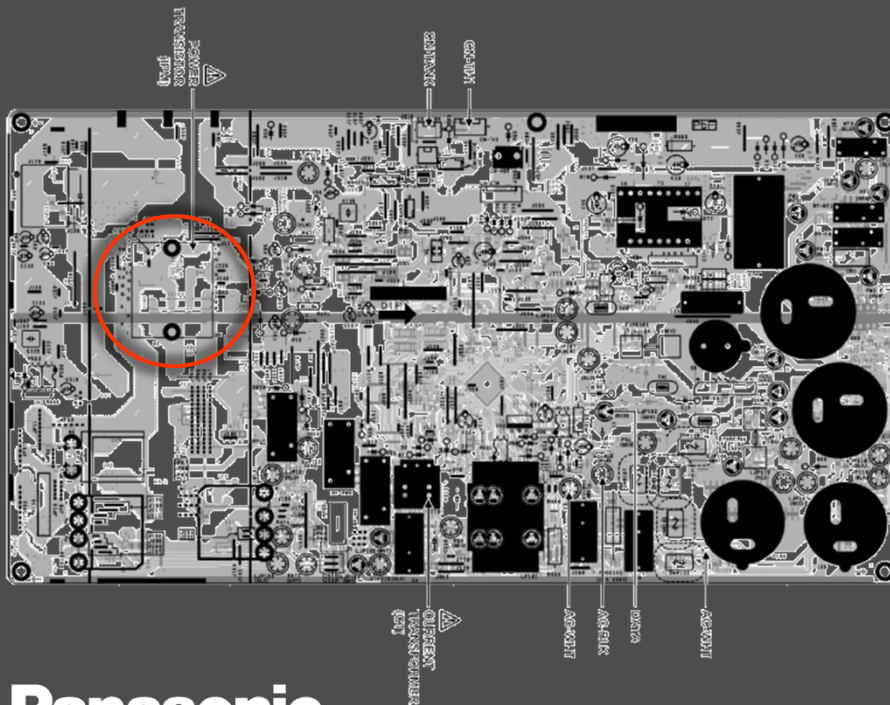
### Failure Judgment Conditions

Error code will be displayed ,

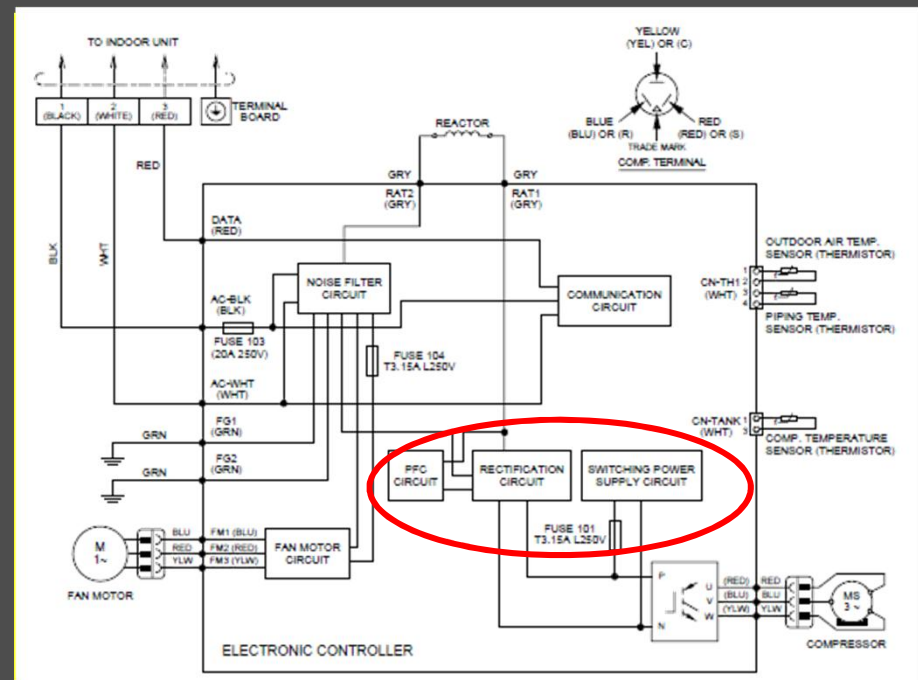
- When the IPM temperature raises to 120°C the compressor will stop immediately.
- Compressor operation restarts after 3 minutes the temperature decreases to 115°C.
- If this condition repeats continuously 4 times within 20 minutes, timer LED will be blinking ("F96" is indicated).

### Failure Root Causes (Primary location /parts to verify)

- IPM overheats due to short circuit of hot discharge air flow.
- IPM overheats due to defective of outdoor fan motor.
- IPM overheats due to defective of internal circuitry of IPM.
- IPM overheats due to defective IPM temperature sensor.

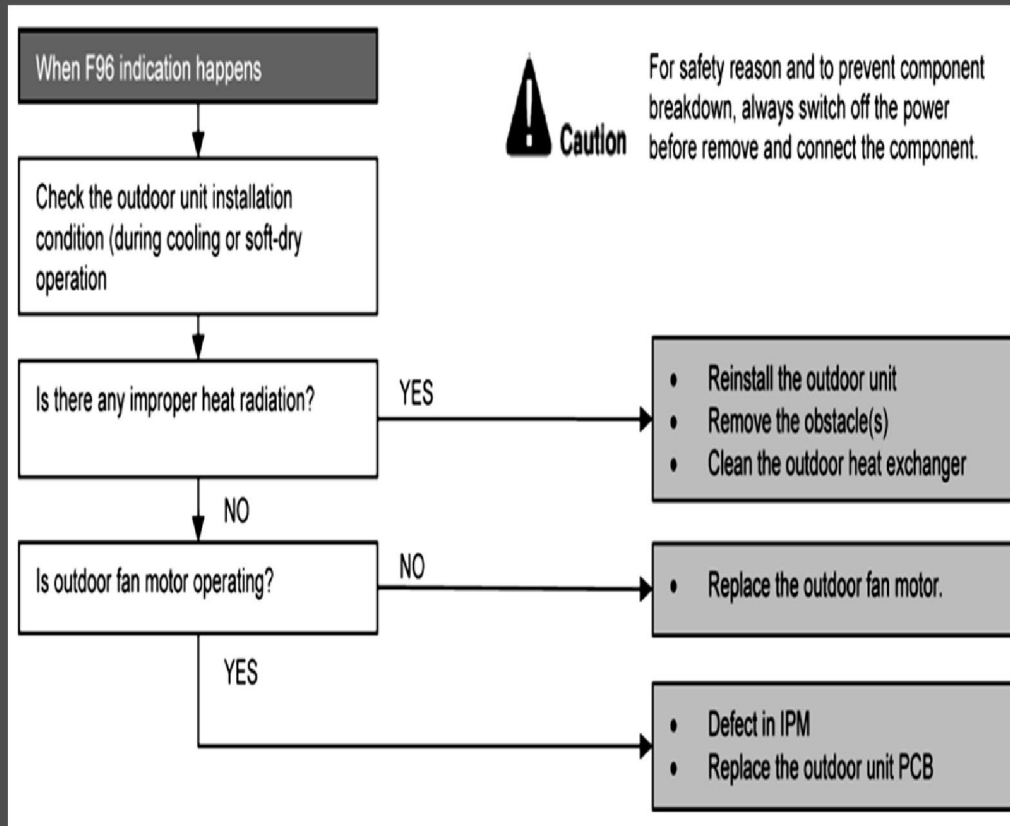


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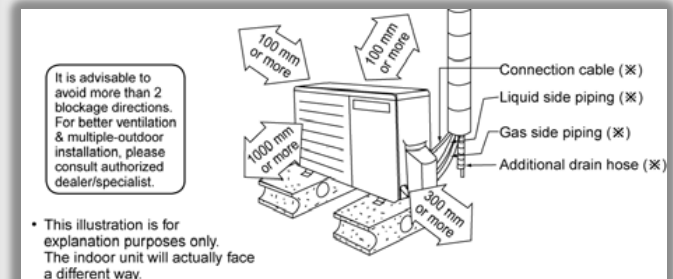
# Troubleshooting Guide - Inverter

## F96 Troubleshooting Flow Chart



### 1st Checking Point :

Check the outdoor unit installation condition for improper heat radiation



### 2nd Checking Point :

Check outdoor fan motor operation

### 3rd Checking Point :

If above checking is no issue , then outdoor PCB is defective

# Troubleshooting Guide - Inverter

## F97 (Compressor Overheating)

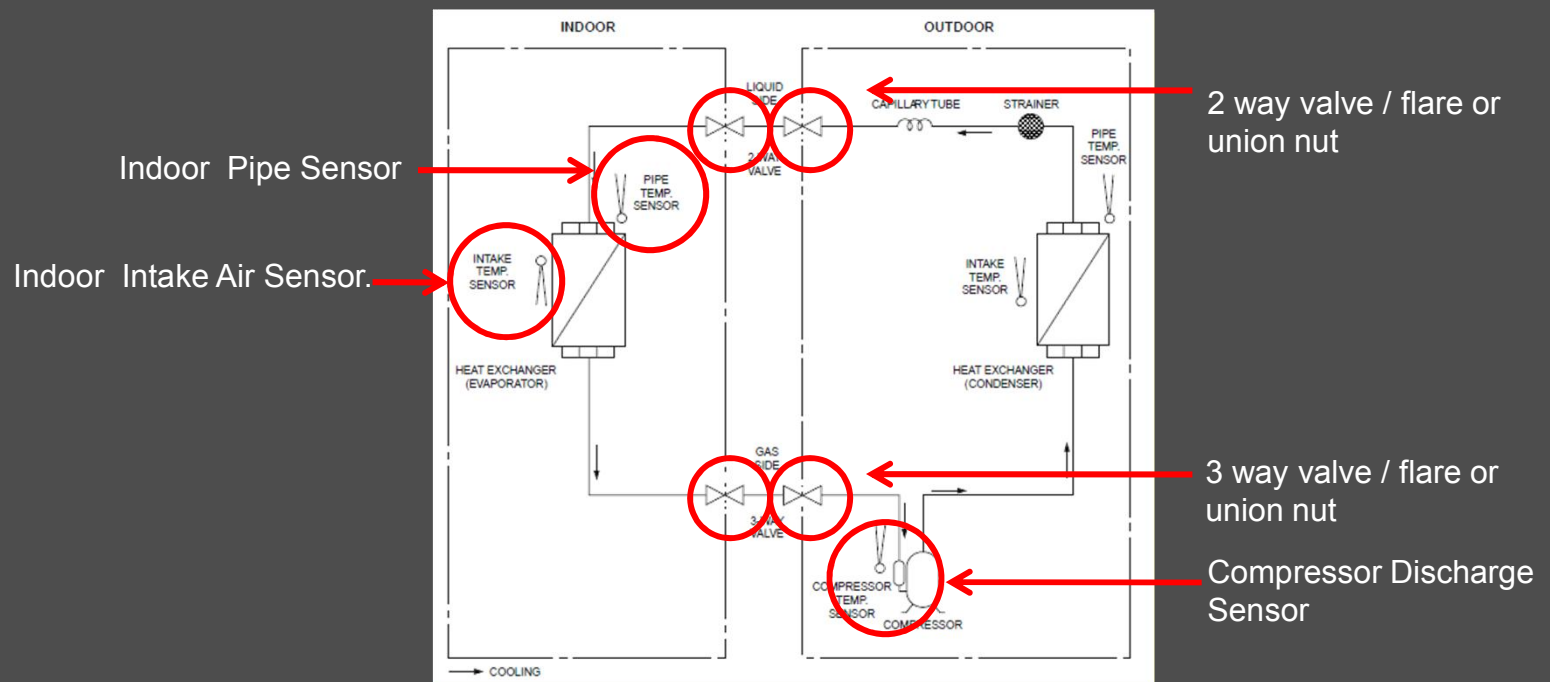
### Failure Judgment Conditions

Error code will be displayed ,when compressor discharge temperature detected high (112 Deg C) by the compressor discharge temperature sensor.

•If this condition repeats continuously for 4 times in 20 mints, timer LED will be blinking (“F97” is indicated).

### Failure Root Causes (Primary location /parts to verify)

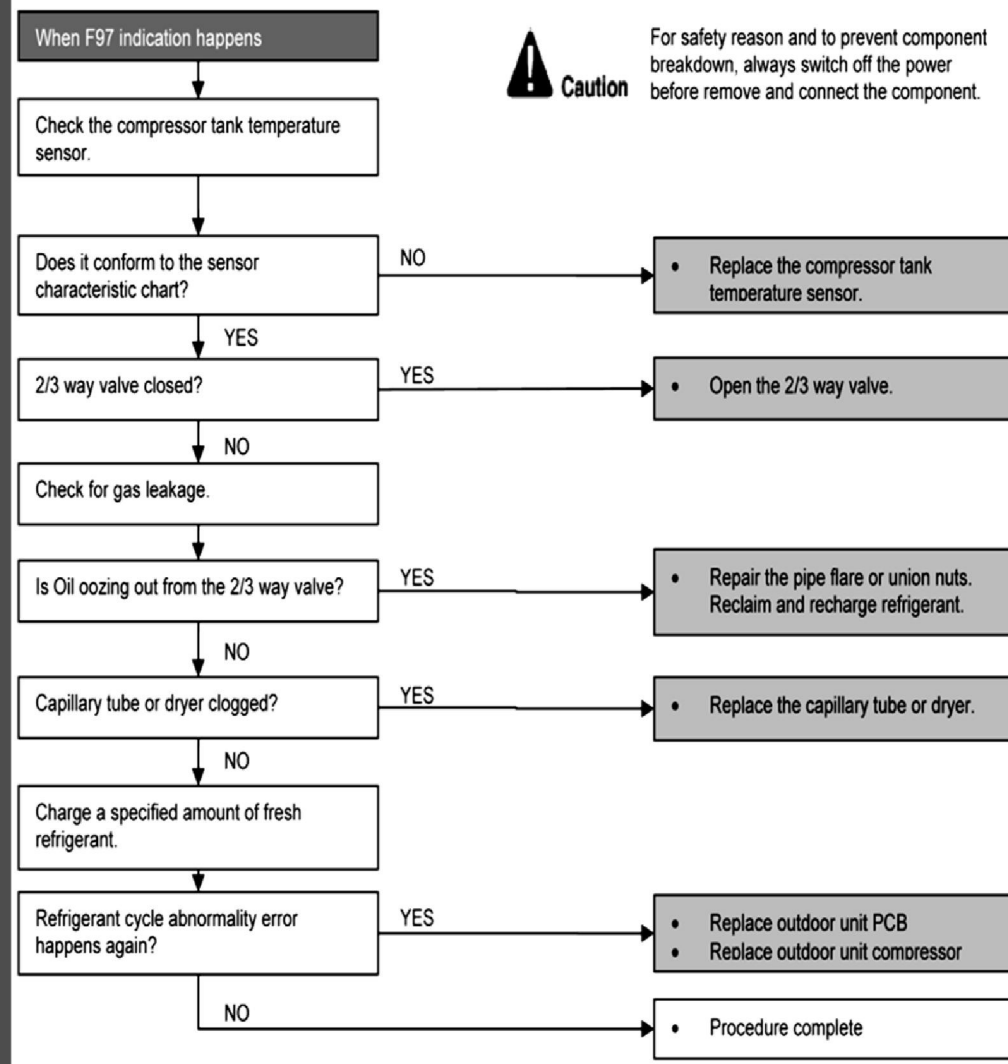
- Refrigerant shortage (refrigerant leakage).
- 2/3 way valve closed.
- Detection error due to faulty compressor tank temperature sensor.





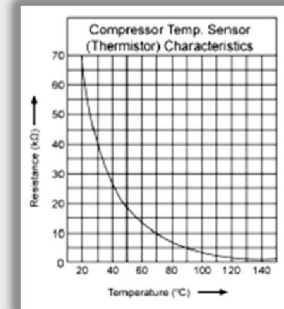
# Troubleshooting Guide - Inverter

## F97 Troubleshooting Flow Chart



### 1st Checking Point :

Check the comp discharge temperature sensor characteristic



### 2nd Checking Point :

Check is oil oozing out from 2way and 3 way valve

### 3rd Checking Point :

Check is capillary tube clogged

### 4th Checking Point :

If above checking is no issue , then outdoor PCB / compressor is defective



# Troubleshooting Guide - Inverter

## F98 (Input Over Current Detection)

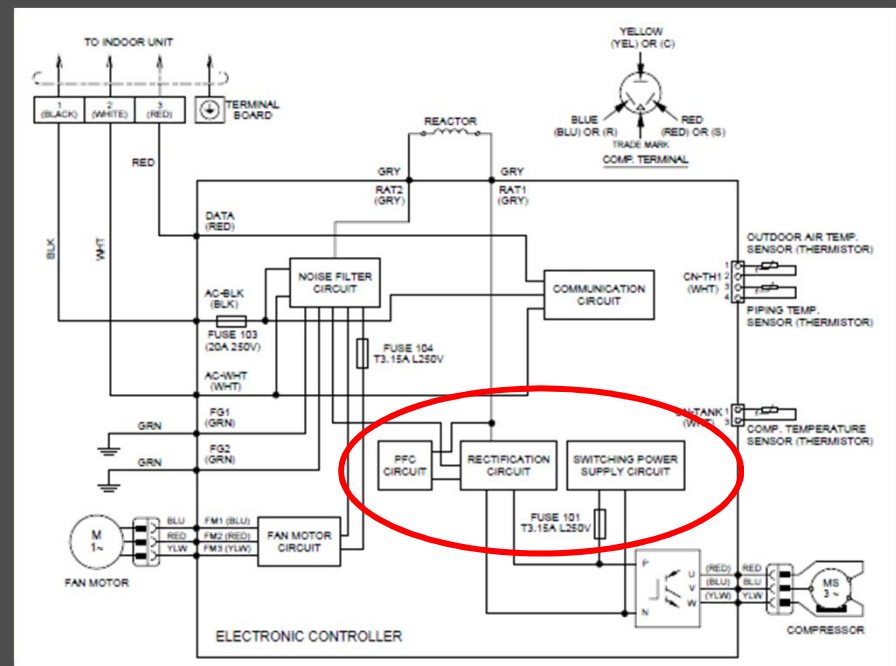
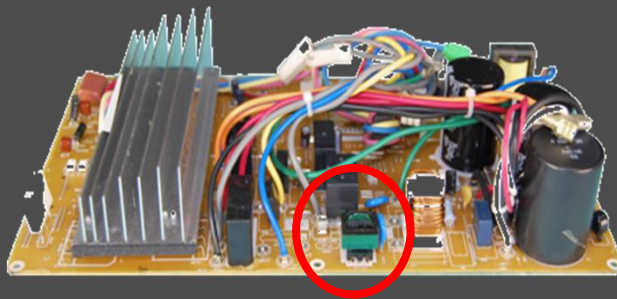
### Failure Judgment Conditions

Error code will be displayed ,when an input over current (16.8A) is detected by checking the input current valve being detected by the current transformer(CT) with the compressor running.

•If this condition repeats continuously for 3 times in 20 mints, timer LED will be blinking (“F98” is indicated).

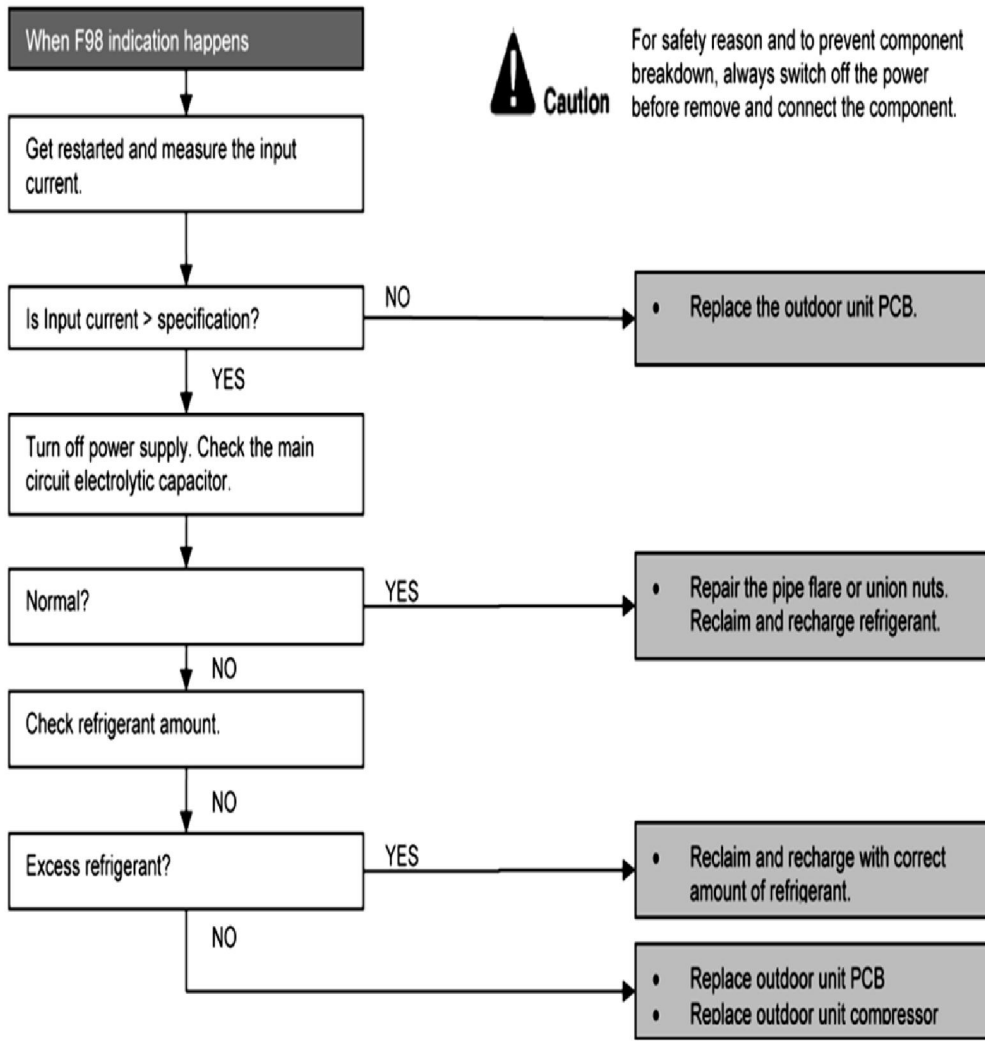
### Failure Root Causes (Primary location /parts to verify)

- Over-current due to compressor failure.
- Over-current due to defective outdoor unit PCB.
- Over-current due to defective inverter main circuit electrolytic capacitor.
- Over-current due to excessive refrigerant.



# Troubleshooting Guide - Inverter

## F98 Troubleshooting Flow Chart



### 1st Checking Point :

Check the input current value at the current transformer

### 2nd Checking Point :

Check the electrolytic capacitor resistance

### 3rd Checking Point :

Check refrigerant pressure to confirm the refrigerant amount

### 4th Checking Point :

Check outdoor PCB & Compressor functioning

# Troubleshooting Guide - Inverter

## F99 (DC Peak Current Detection)

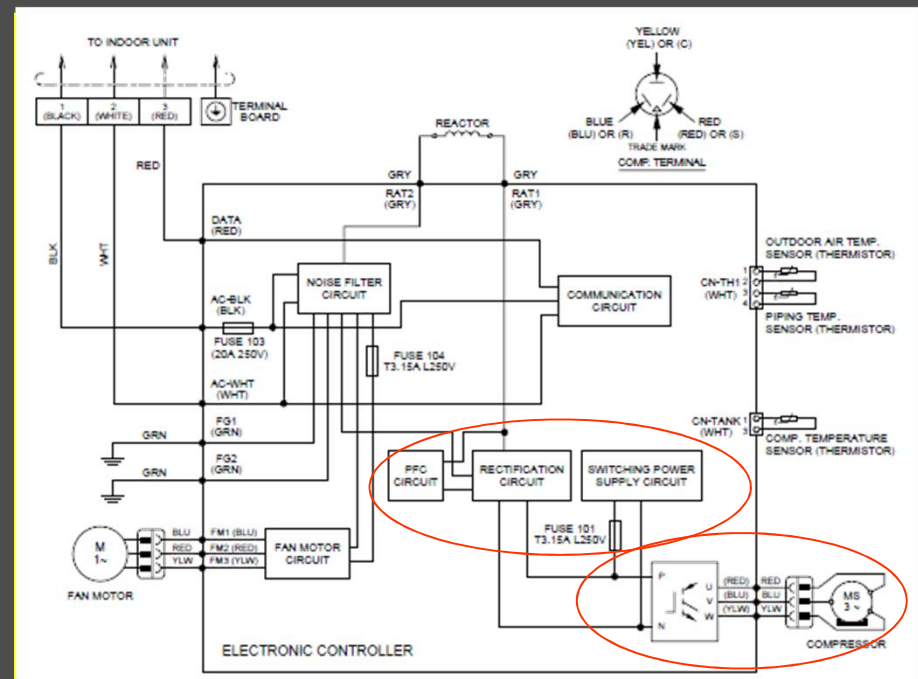
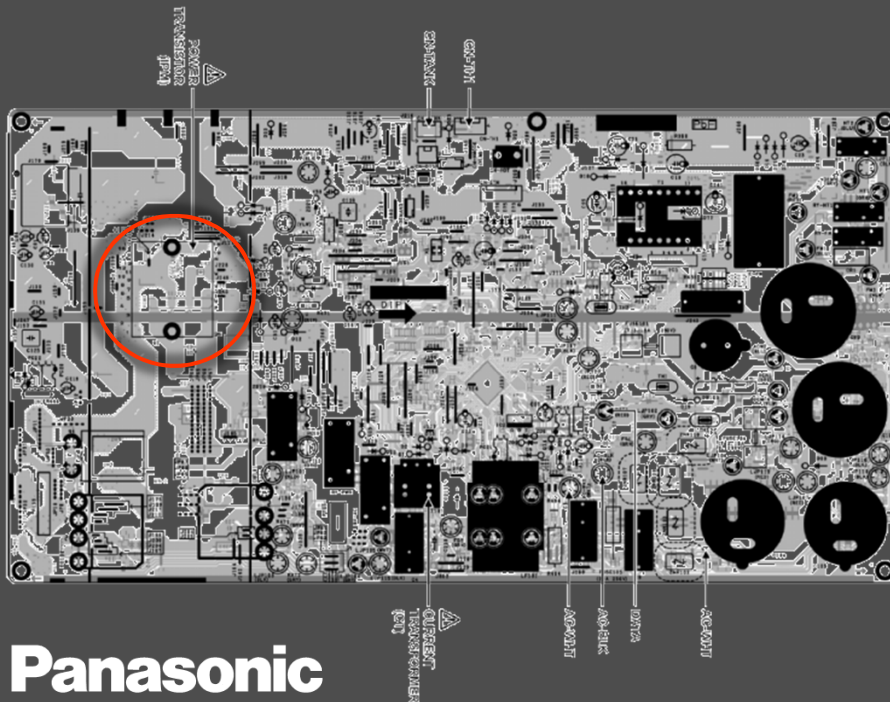
## Failure Judgment Conditions

Error code will be displayed ,

- When supply current to IPM (DC peak sensing circuitry) exceeds set value of 13.2A (S9XX), 13.1A (S12XX), 17.1A (S15, 18XX), 27.7A (S24XX) within 30 seconds, the compressor will stop operation. then, operation will restart after 1minute.
- For second occurrence onwards, if the set value exceeds again within 30 seconds, the compressor will stop operation. Then, operation will restart after 3 minutes.
- If this condition repeats continuously for 7 times, all indoor and outdoor relays will be cut off, timer LED will be blinking (“F99” is indicated).

### Failure Root Causes (Primary location /parts to verify)

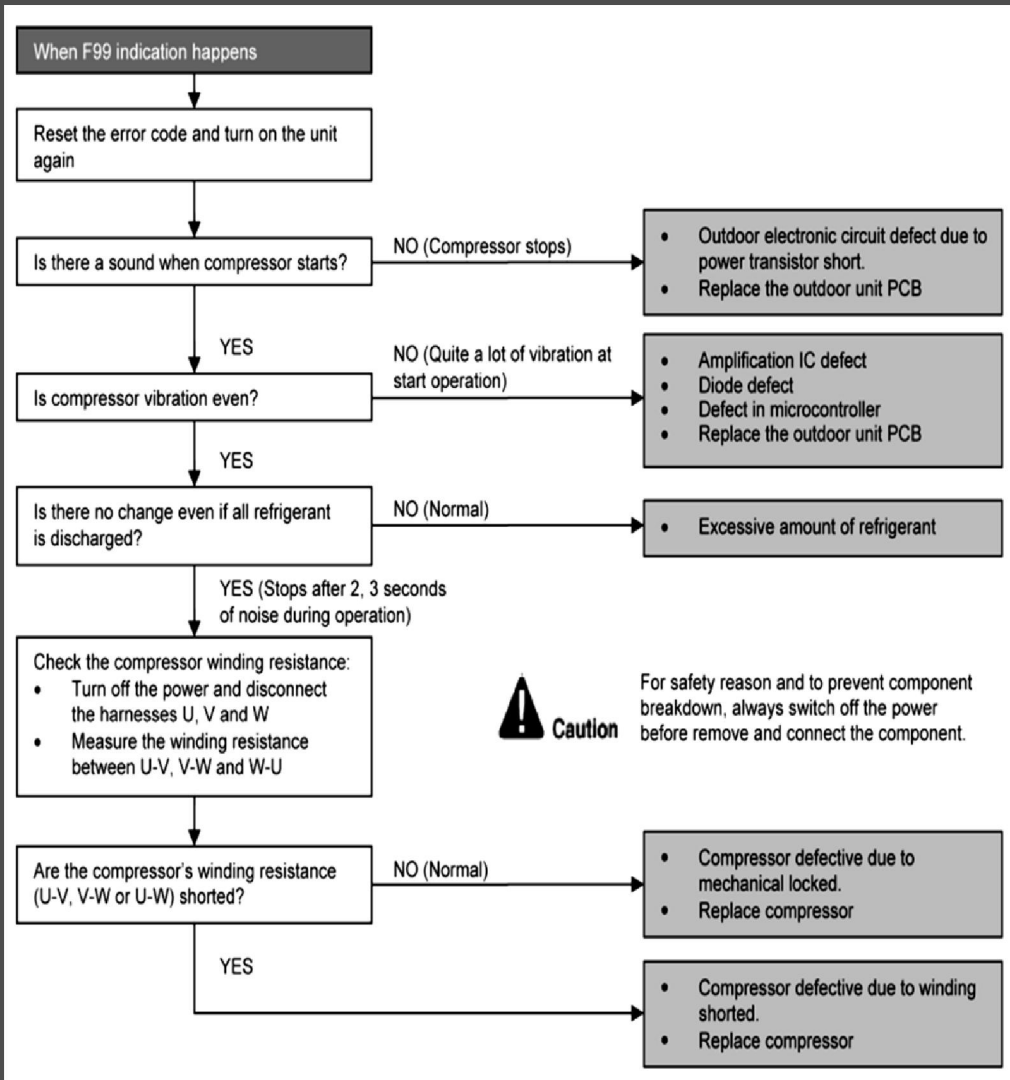
- DC current peak due to compressor failure.
- DC current peak due to defective power transistor (IPM).
- DC current peak due to defective outdoor unit PCB.
- DC current peak due to short circuit.



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# Troubleshooting Guide - Inverter

## F99 Troubleshooting Flow Chart



### 1st Checking Point :

Check is there a sound when compressor starts.

### 2nd Checking Point :

Check is compressor vibration even or not.

### 3rd Checking Point :

Check is the compressor vibration change if all refrigerant discharged.

### 4th Checking Point :

Check the compressor winding resistance U,V and W.

Sample value

Resistance of Compressor Windings

MODEL	CU-S18PK
CONNECTION	5RD132XGA21
U-V	1. 276Ω
U-W	1. 276Ω
V-W	1. 276Ω

Note: Resistance at 20°C of ambient temperature.

# Troubleshooting Four Way Valve Abnormality (F11)

## **Malfunction Decision Conditions:**

1. During heating operation, when indoor pipe temperature is below 10°C.
2. During cooling operation, when indoor pipe temperature is above 45°C.

## **Malfunction Caused:**

1. Connector in poor contact.
2. Faulty sensor.
3. Faulty outdoor unit PCB.
4. Four way valve defective.

## **Abnormality Judgment:**

Continue 4 times in 30 minutes.

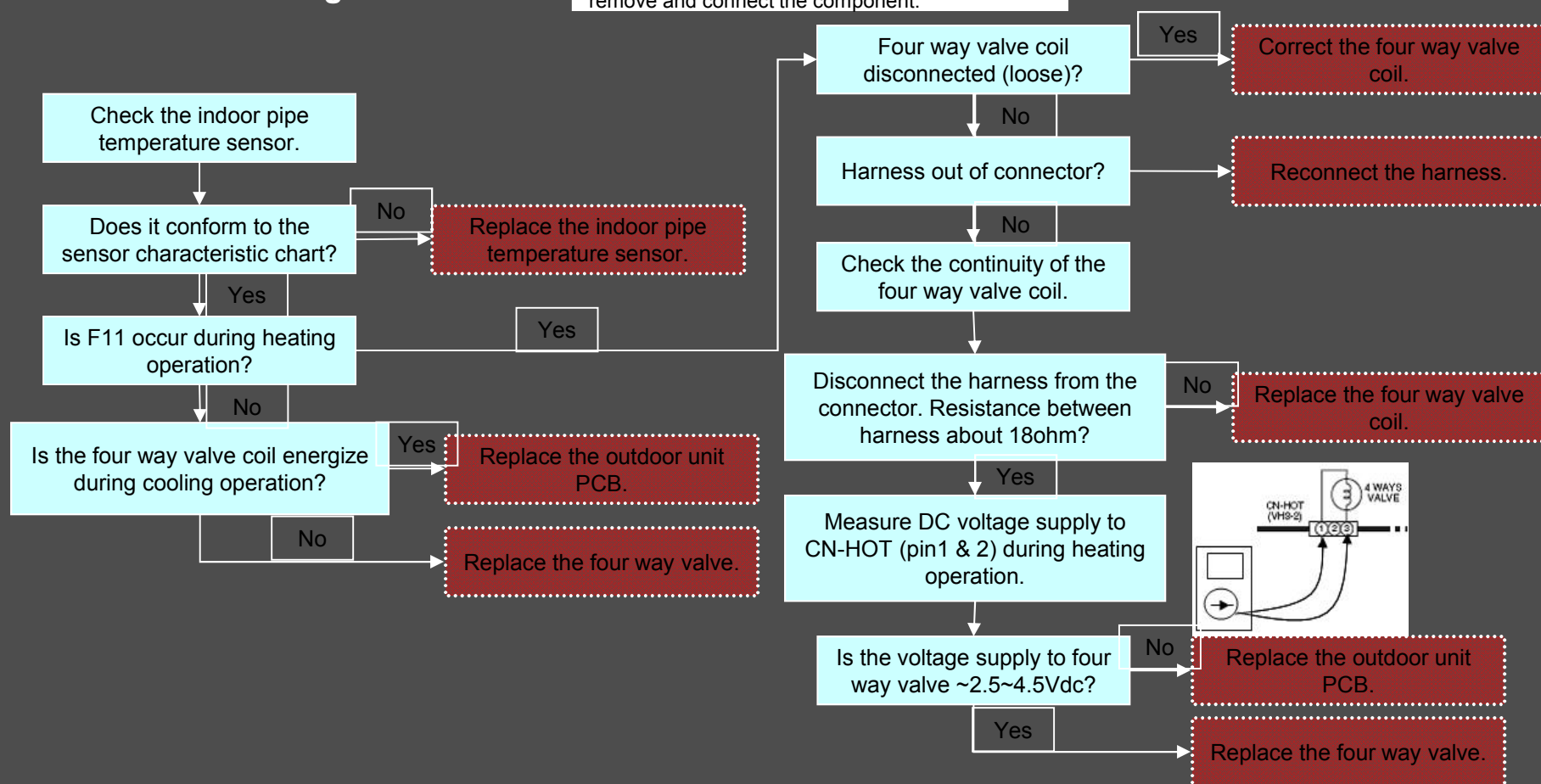
# Troubleshooting Four Way Valve Abnormality (F11)

## Troubleshooting:



**Caution**

For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.





# Troubleshooting Guide - Inverter

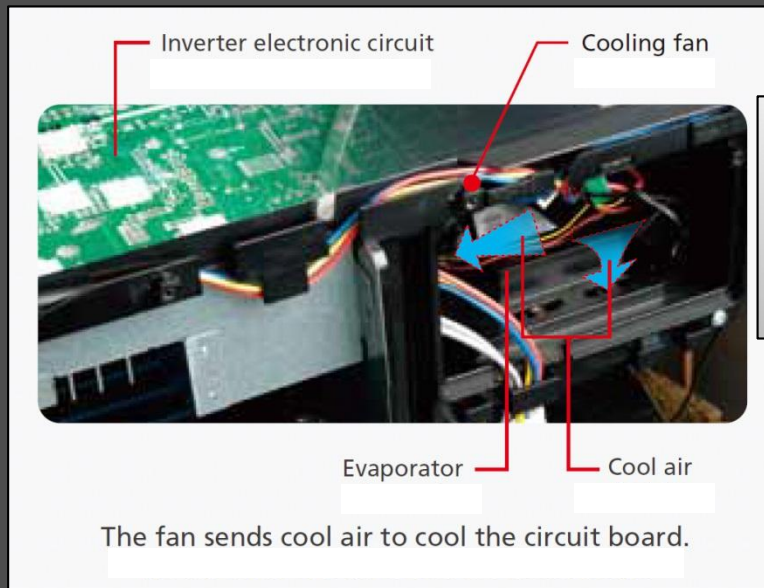
## H71 Cooling Fan Error (Only for Super tropical inverter )

### Judgment condition:-

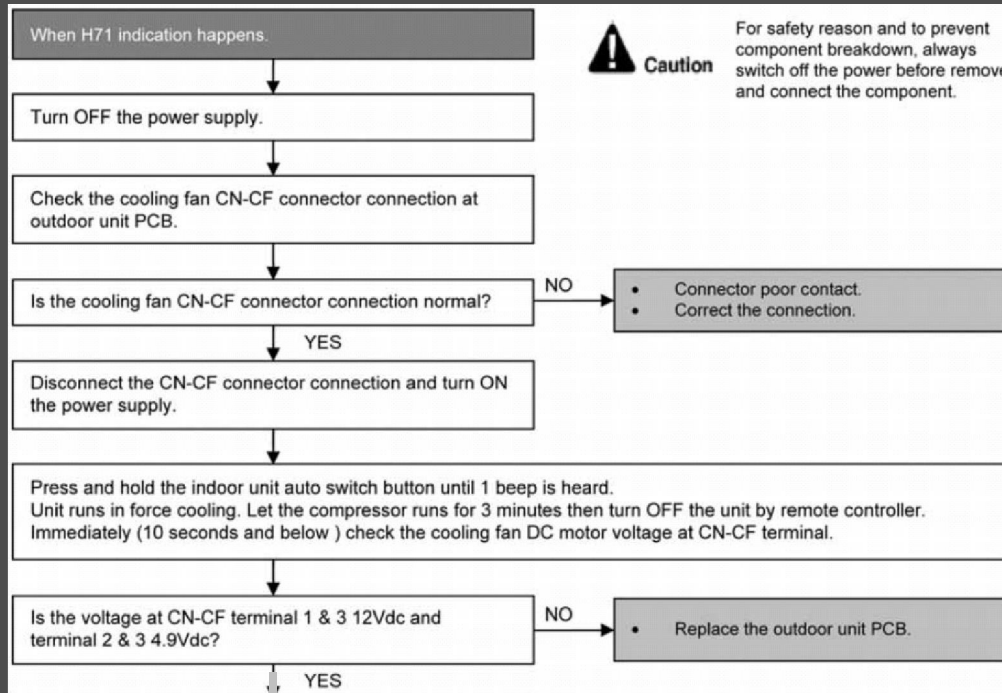
- During cooling fan operation, when the feedback rotation of the DC motor is  $> 12,000\text{rpm}$  or  $< 5,400\text{rpm}$  continuously 10 seconds.

### Failure root causes :-

- DC motor locked.
- DC motor connector connection loose.
- DC motor winding short circuit.
- DC motor winding open circuit.
- DC motor lead wire broken.
- Outdoor unit PCB faulty.



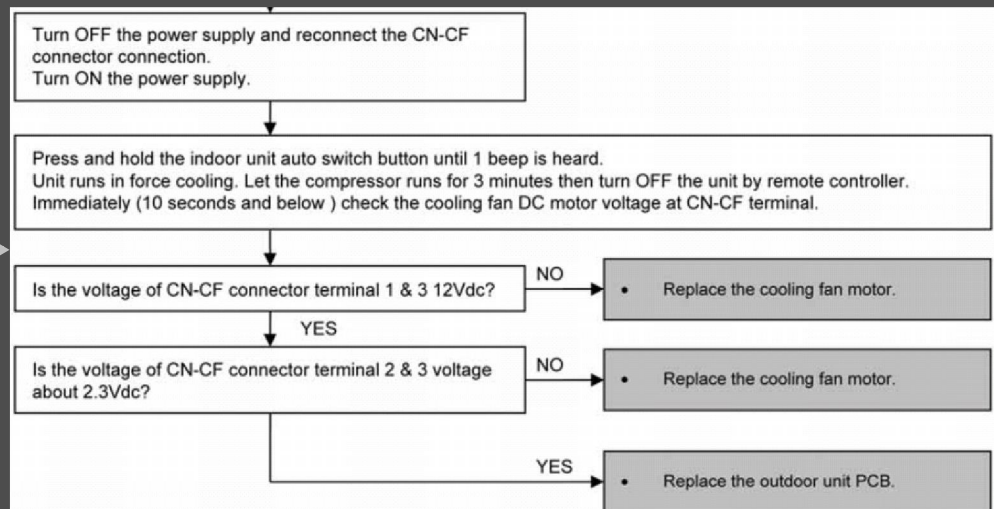
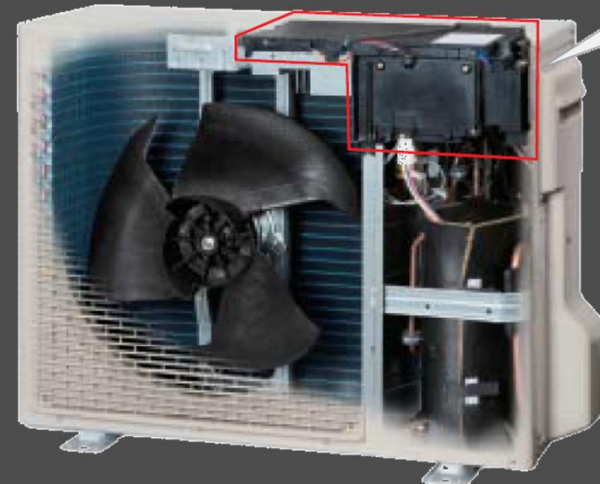
# Troubleshooting Guide - Inverter



**Caution**

For safety reason and to prevent component breakdown, always switch off the power before remove and connect the component.

## H71 Cooling Fan Error (Only for Super tropical inverter )





The End

Thank You

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