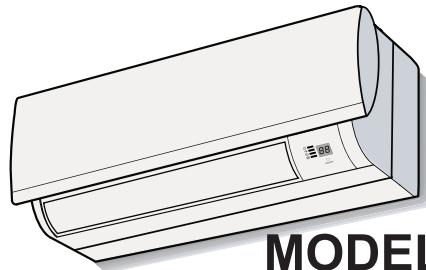


# SHARP SERVICE MANUAL



**MODELS AY-X9PSR  
AY-X12PSR**

**SC213AYX9PSR/C**

## SPLIT TYPE ROOM AIR CONDITIONER

**INDOOR UNIT**

**OUTDOOR UNIT**

**AE-X9PSR**

**AE-X12PSR**

In the interests of user-safety (Required by safety regulations in some countries) the set should be restored to its original condition and only parts identical to those specified should be used.

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Parts marked with "⚠" are important for maintaining the safety of the set. Be sure to replace these parts with specified ones for maintaining the safety and performance of the set.

**SHARP CORPORATION**

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The contents are subject to change without notice.

# CHAPTER 1. PRODUCT SPECIFICATION

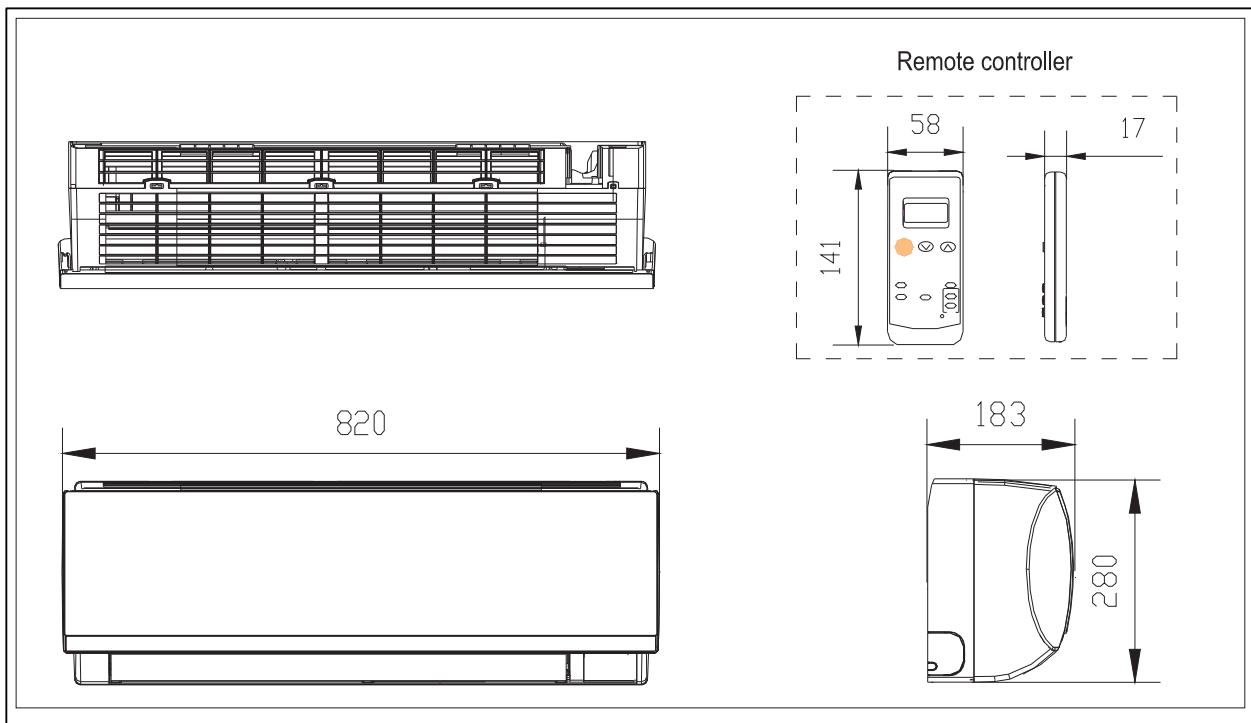
## [1] SPECIFICATION

### 1. AY-X9PSR/AY-X12PSR

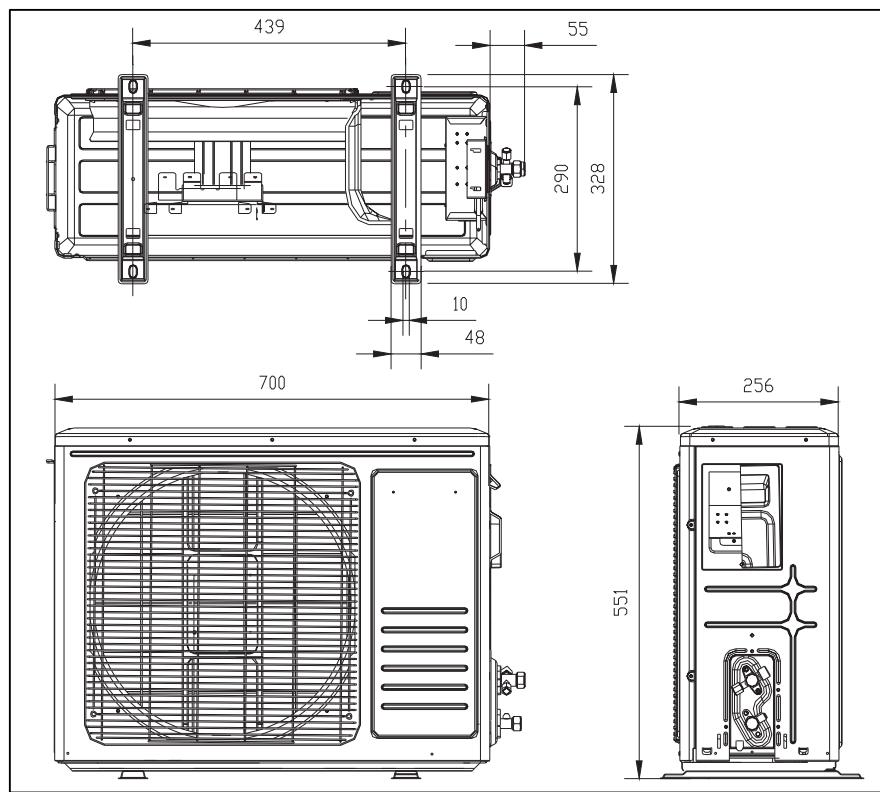
| ITEMS                             |                    | MODEL    | INDOOR UNIT<br>AY-X9PSR                 | OUTDOOR UNIT<br>AE-X9PSR | INDOOR UNIT<br>AY-X12PSR                | OUTDOOR UNIT<br>AE-X12PSR |
|-----------------------------------|--------------------|----------|---|--------------------------|---|---------------------------|
| Rated cooling capacity(Min-Max)   |                    | kW       | 2.6(1.00-3.10)                          |                          | 3.5(1.1-3.7)                            |                           |
| Rated heating capacity(Min-Max)   |                    | kW       | 2.6(1.0-3.80)                           |                          | 3.5(1.1-4.5)                            |                           |
| Moisture removal(at cooling)      |                    | Liters/h | 0.8                                     |                          | 1.0                                     |                           |
| <b>Electrical date</b>            |                    |          |   |                          |   |                           |
| Phase                             |                    |          | Single                                  |                          | Single                                  |                           |
| Rated frequency                   |                    | Hz       | 50                                      |                          | 50                                      |                           |
| Rated voltage                     |                    | V        | 220-240                                 |                          | 220-240                                 |                           |
| Rated current(Min-Max)            | Cool               | A        | 3.5(1.32-5.0)                           |                          | 4.9(1.32-6.1)                           |                           |
|                                   | Heat               | A        | 3.1(1.32-6.4)                           |                          | 4.6(1.32-7.8)                           |                           |
| Rated input(Min-Max)              | Cool               | W        | 760(290-1100)                           |                          | 1060(290-1330)                          |                           |
|                                   | Heat               | W        | 680(290-1400)                           |                          | 1010(290-1700)                          |                           |
| Power factor                      | Cool               | %        | 94                                      |                          | 94                                      |                           |
|                                   | Heat               | %        | 95                                      |                          | 95                                      |                           |
| Maximum operating current         |                    | A        | 6.4                                     |                          | 7.8                                     |                           |
| Compressor                        | Type               |          | Hermetically sealed ROTARY TYPE         |                          | Hermetically sealed ROTARY TYPE         |                           |
|                                   | Model              |          | DA89M1C-81EZ8                           |                          | DA108M1C-81EZ8                          |                           |
|                                   | Oil charge         |          | 370ml (ESTER OIL VG74)                  |                          | 370ml (ESTER OIL VG74)                  |                           |
| Refrigerant system                | Evaporator         |          | Louver fin and grooved tube type        |                          | Louver fin and grooved tube type        |                           |
|                                   | Condenser          |          | Louver fin and grooved tube type        |                          | Louver fin and grooved tube type        |                           |
|                                   | Control            |          | Microcomputer controlled reverse system |                          | Microcomputer controlled reverse system |                           |
|                                   | Refrigerant(R410A) |          | 750                                     |                          | 950                                     |                           |
|                                   | De-Ice system      |          | Microcomputer controlled reverse system |                          | Microcomputer controlled reverse system |                           |
| Noise Level(at cooling)           | High               | dB(A)    | 38                                      | 60                       | 38                                      | 62                        |
|                                   | Low                | dB(A)    | 34                                      | —                        | 34                                      | —                         |
|                                   | Soft               | dB(A)    | 26                                      | —                        | 26                                      | —                         |
| <b>Fan system</b>                 |                    |          |   |                          |   |                           |
| Drive                             |                    |          | Direct drive                            |                          | Direct drive                            |                           |
| Air flow quantity(at cooling)     | High               | m3/min   | 11.0                                    | 31.7                     | 11.0                                    | 28.3                      |
|                                   | Low                | m3/min   | 8.4                                     | —                        | 8.4                                     | —                         |
|                                   | Soft               | m3/min   | 5.8                                     | —                        | 5.8                                     | —                         |
| Fan                               |                    |          | Cross flow fan                          | Propeller fan            | Cross flow fan                          | Propeller fan             |
| <b>Connections</b>                |                    |          |   |                          |   |                           |
| Refrigerant coupling              |                    |          | Flare tpye                              |                          | Flare tpye                              |                           |
| Refrigenrant tube size Gas,Liquid |                    |          | 3/8", 1/4"                              |                          | 1/2", 1/4"                              |                           |
| Drain pipe                        |                    |          | O.Dφ16                                  |                          | O.Dφ16                                  |                           |
| <b>Others</b>                     |                    |          |   |                          |   |                           |
| Safety device                     |                    |          | Fan motor:thermal fuse                  |                          | Fan motor:thermal fuse                  |                           |
|                                   |                    |          | Fuse,Micro compute control              |                          | Fuse,Micro compute control              |                           |
| Air filters                       |                    |          | Polypropylene net(washable)             |                          | Polypropylene net(washable)             |                           |
| Net dimensions                    | Width              | mm       | 820                                     | 700                      | 820                                     | 700                       |
|                                   | Height             | mm       | 280                                     | 256                      | 280                                     | 256                       |
|                                   | Depth              | mm       | 183                                     | 551                      | 183                                     | 551                       |
| Net/Gross weight                  |                    | kg       | 10/12                                   | 24/28                    | 10/12                                   | 26/30                     |

## [2] EXTERNAL DIMENSION

### INDOOR UNIT



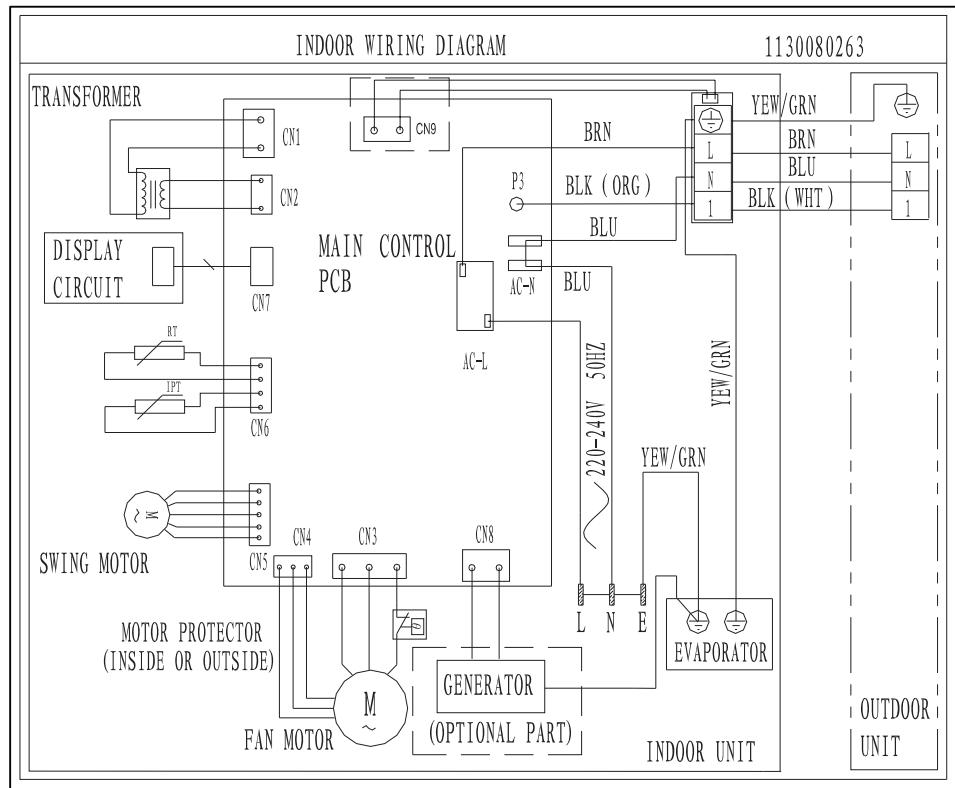
### OUTDOOR UNIT



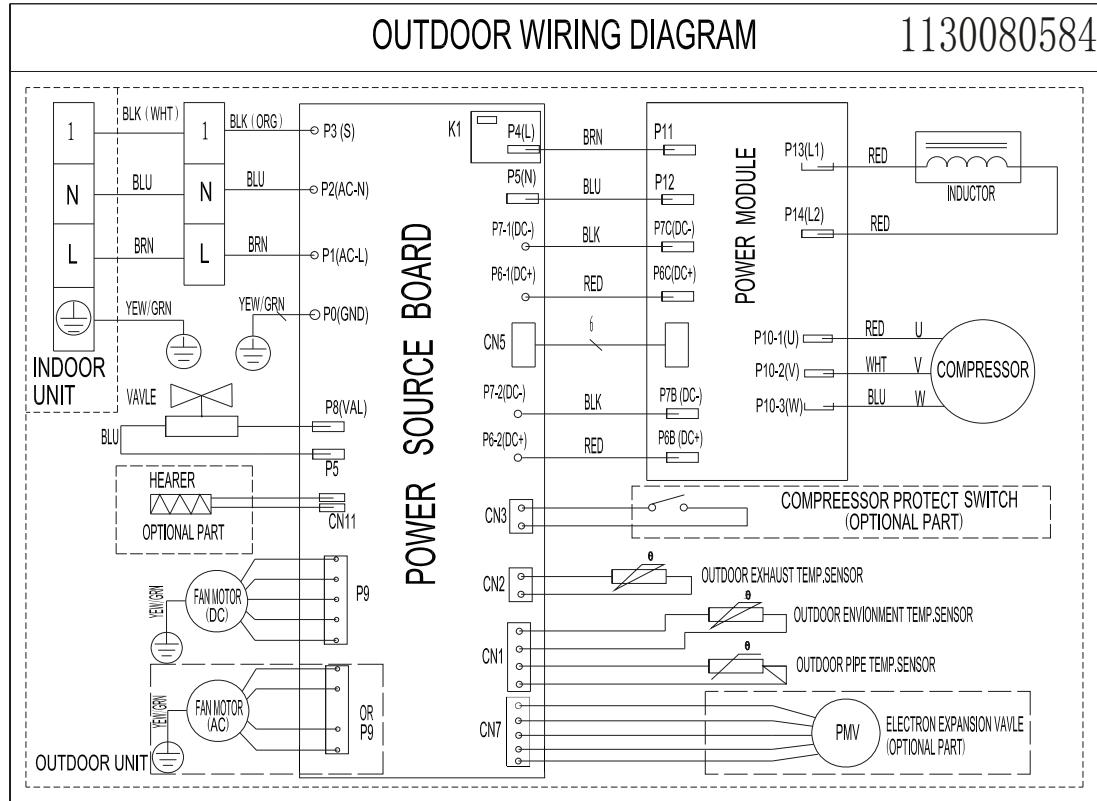
### [3]WIRING DIAGRAM

1.AY-X9PSR/AY-X12PSR  
AE-X9PSR/AE-X12PSR

#### Indoor unit



#### Outdoor unit



## [4]ELECTRICAL PARTS

### 1.AY-X9PSR/AE-X9PSR

#### Indoor unit

| DESCRIPTION      | CODE         | REMARKS           |
|------------------|--------------|-------------------|
| Indoor fan motor | 1170030067   | 220V/50Hz         |
| Main PCB         | 1090260049AA |                   |
| Display PCB      | 1090320292   |                   |
| Transformer      | 1170240024   | 220V/50/60Hz, 12V |
| Vane motor       | 1170020011   | 12V               |
| Indoor sensor    | 1170230001   | 5kΩ               |

#### Outdoor unit

| DESCRIPTION                                | CODE       | REMARKS    |
|--|------------|------------|
| Power source board                         | 210900163  |            |
| Inverter module                            | 210900026  |            |
| Inductor                                   | 1171990046 | 5.0mH, 10A |
| outdoor fan motor                          | 1170040126 | 220V/50Hz  |
| Discharge Temp. sensor                     | 1170230006 | 2.1kΩ      |
| Pipe Temp. sensor and outdoor Temp. sensor | 1170230007 | 5kΩ        |

### 2.AY-X12PSR/AE-X12PSR

#### Indoor unit

| DESCRIPTION      | CODE         | REMARKS           |
|------------------|--------------|-------------------|
| Indoor fan motor | 1170030067   | 220V/50Hz         |
| Main PCB         | 1090260049AA |                   |
| Display PCB      | 1090320292   |                   |
| Transformer      | 1170240024   | 220V/50/60Hz, 12V |
| Vane motor       | 1170020011   | 12V               |
| Indoor sensor    | 1170230001   | 5kΩ               |

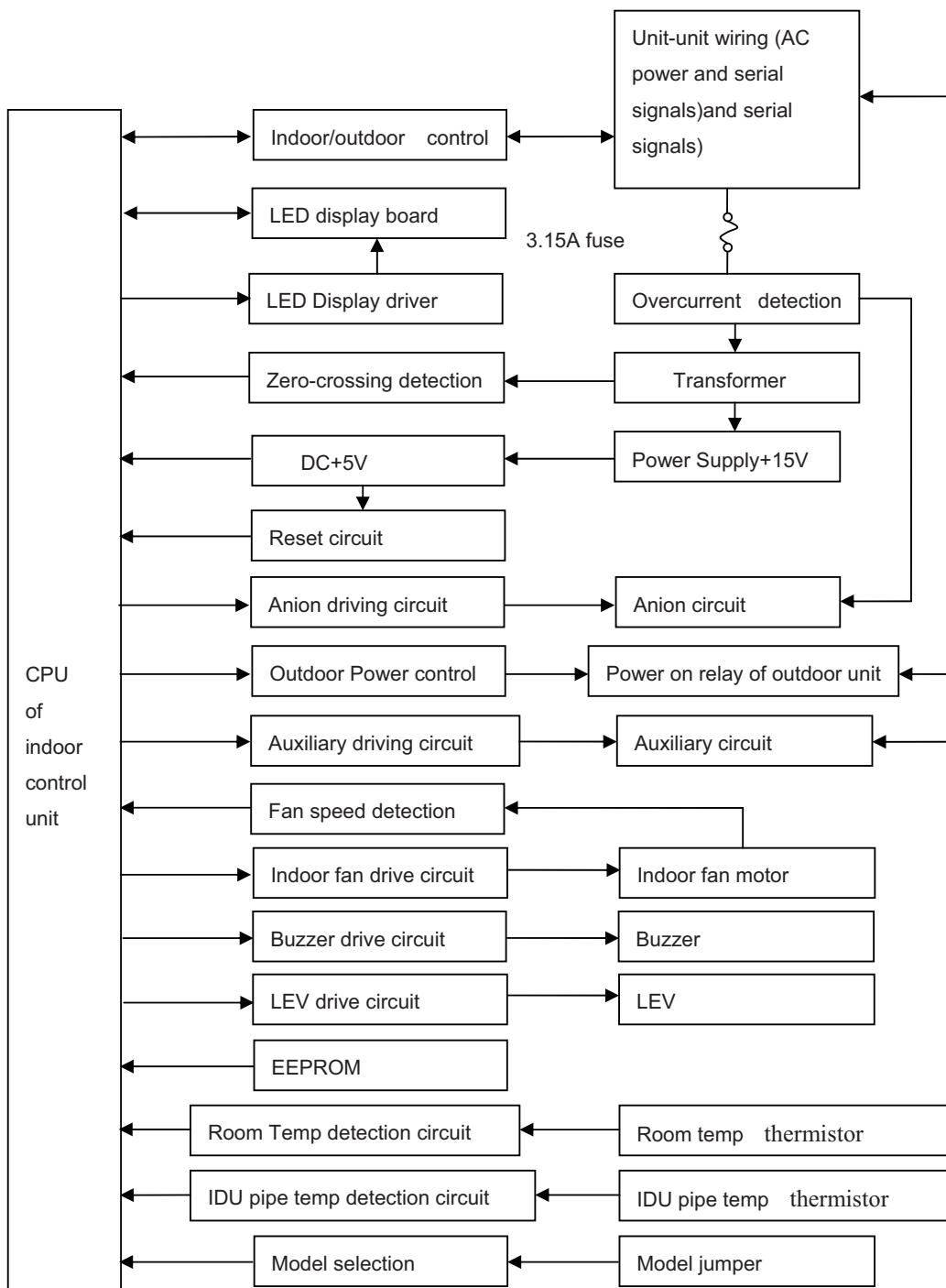
#### Outdoor unit

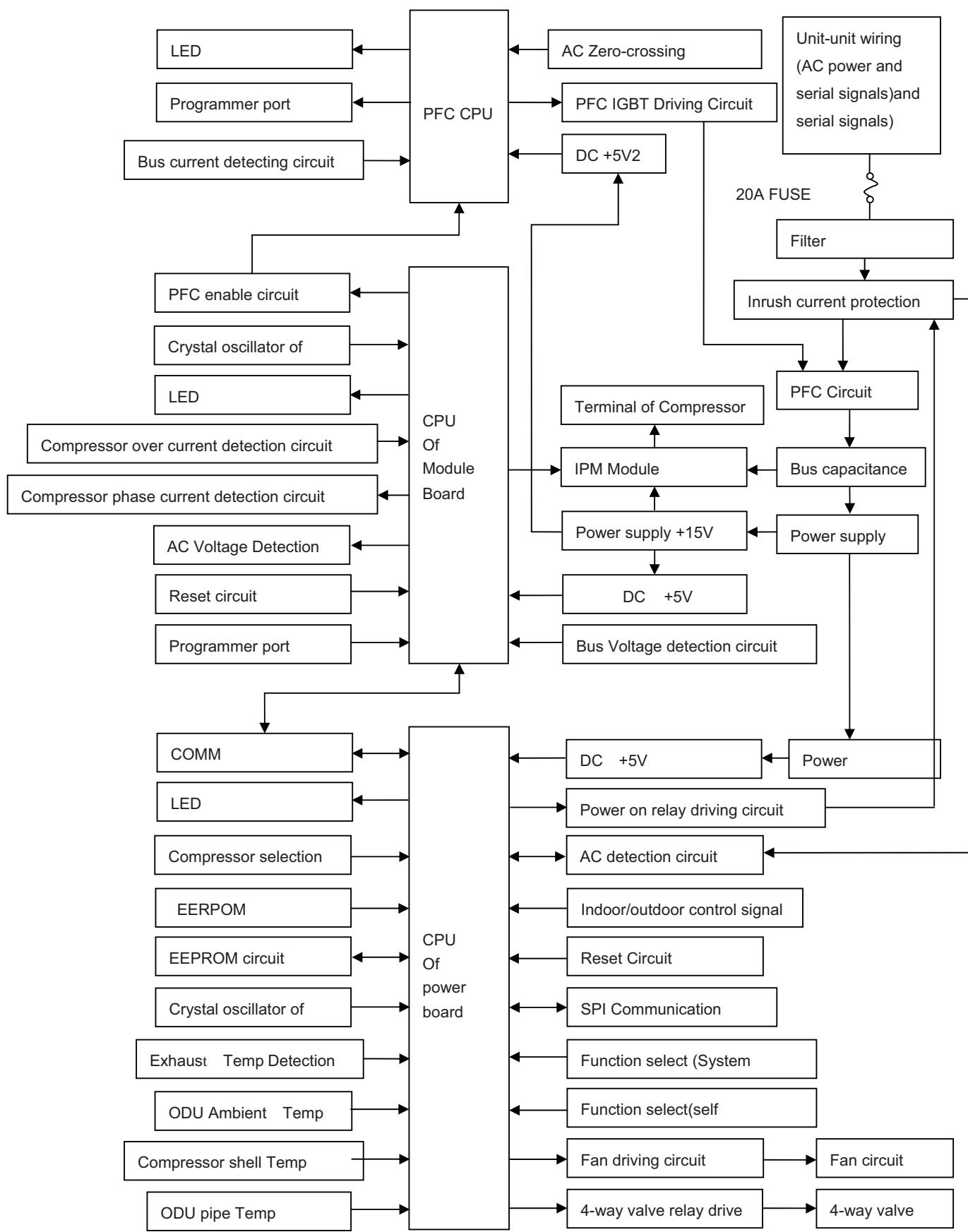
| DESCRIPTION                                | CODE       | REMARKS    |
|--|------------|------------|
| Power source board                         | 210900168  |            |
| Inverter module                            | 210900026  |            |
| Inductor                                   | 1171990046 | 5.0mH, 10A |
| outdoor fan motor                          | 1170040126 | 220V/50Hz  |
| Discharge Temp. sensor                     | 1170230006 | 2.1kΩ      |
| Pipe Temp. sensor and outdoor Temp. sensor | 1170230007 | 5kΩ        |

## CHAPTER 2. EXPLANATION OF CIRCUIT AND OPERATION

### [1] BLOCK DIAGRAM

#### 1. INDOOR UNIT

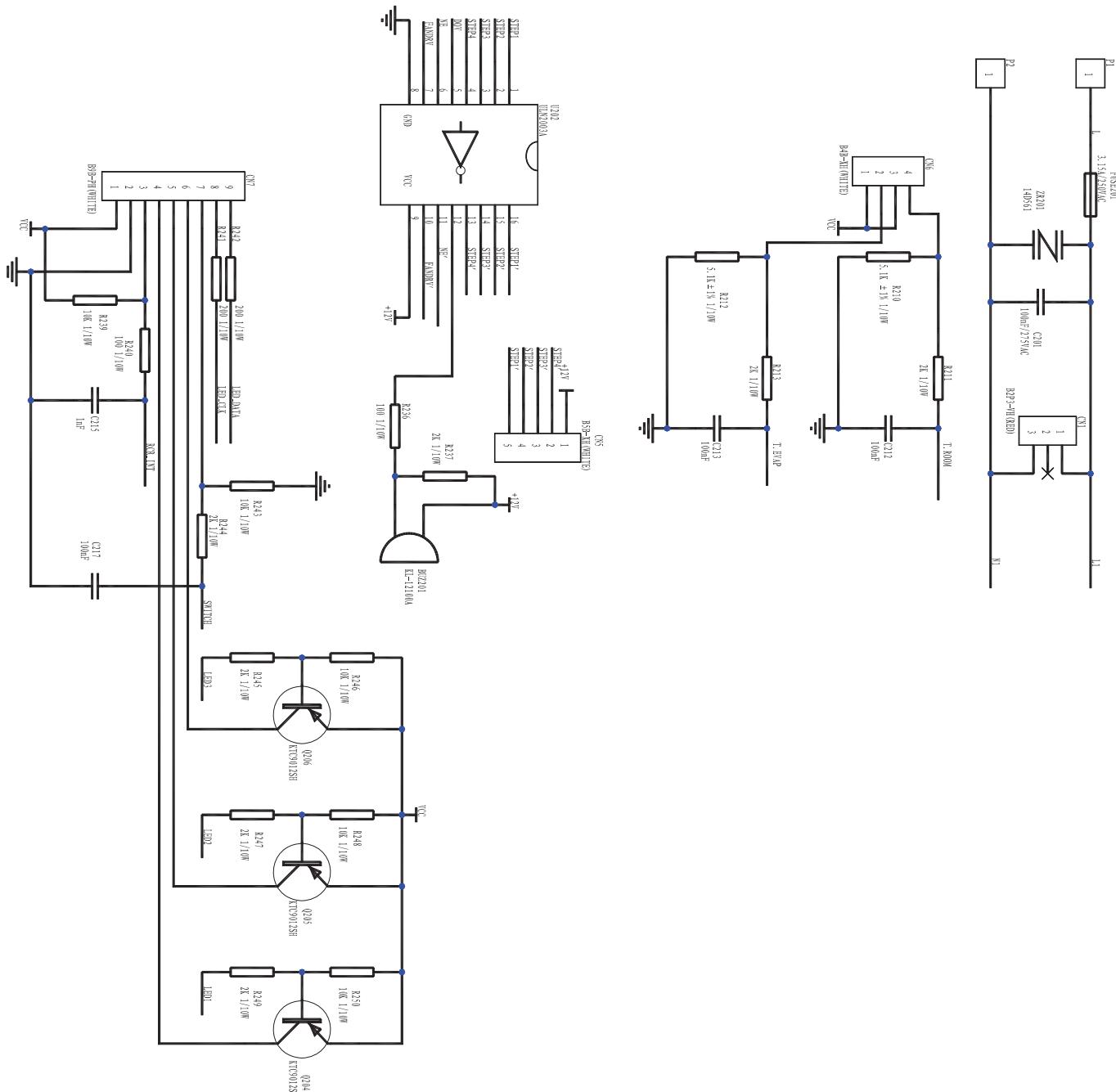


**2. OUTDOOR UNIT**

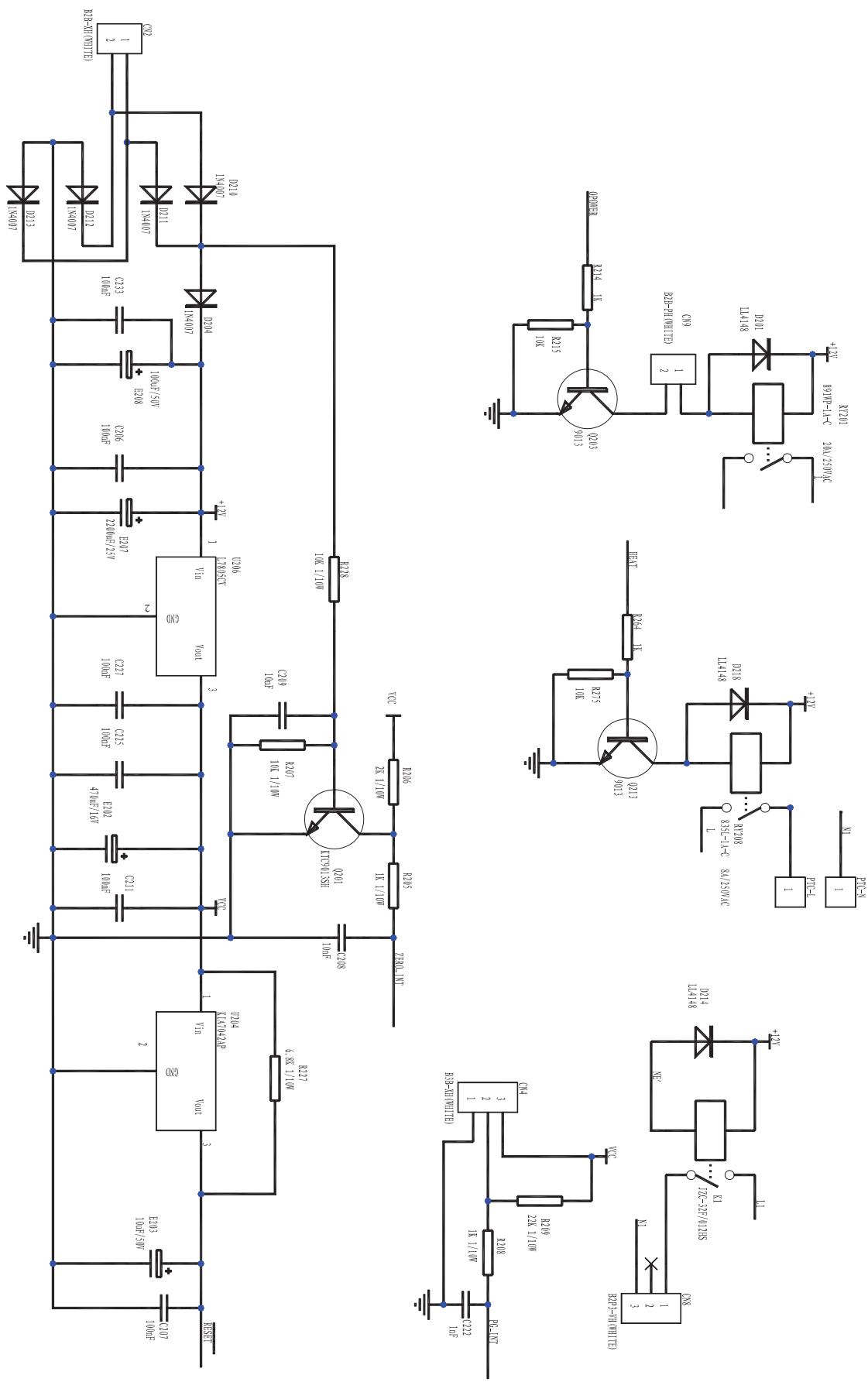
## [2] MICROCOMPUTER CONTROL SYSTEM

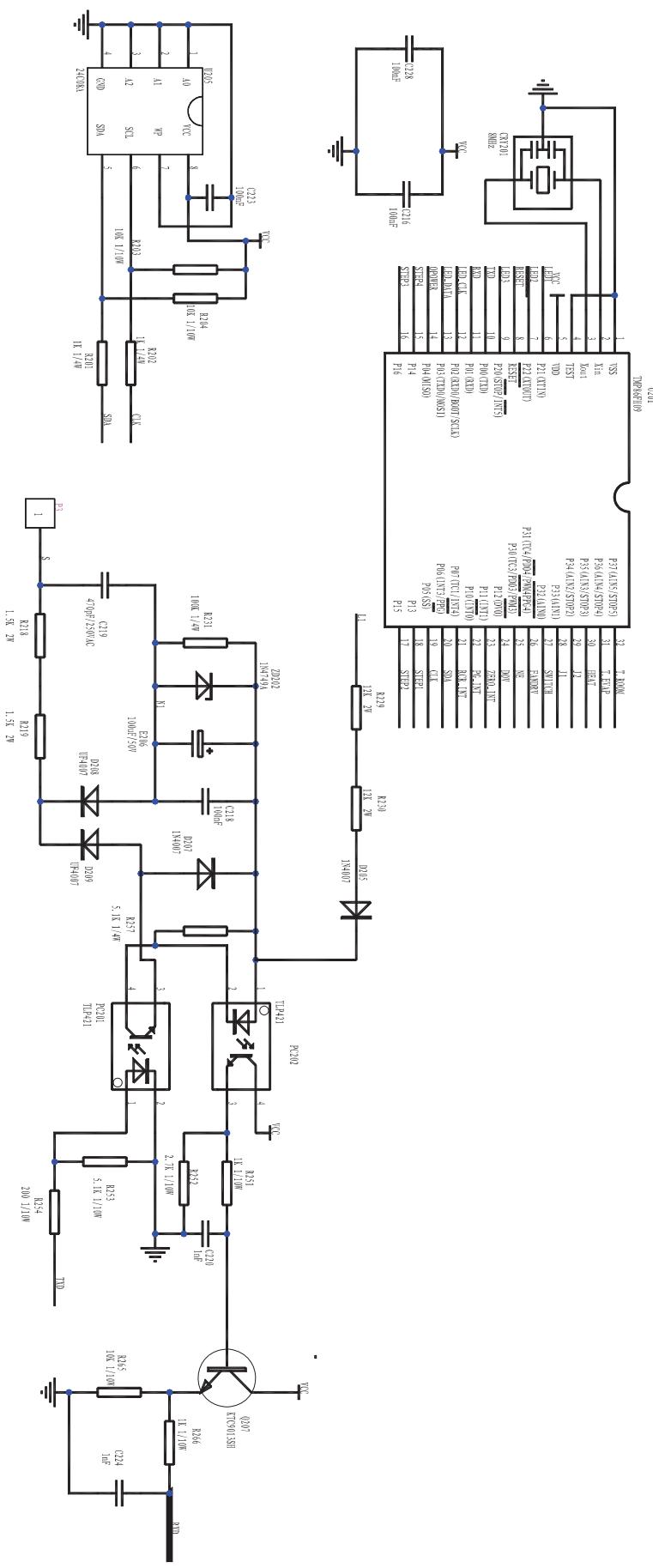
### 1. INDOOR UNIT

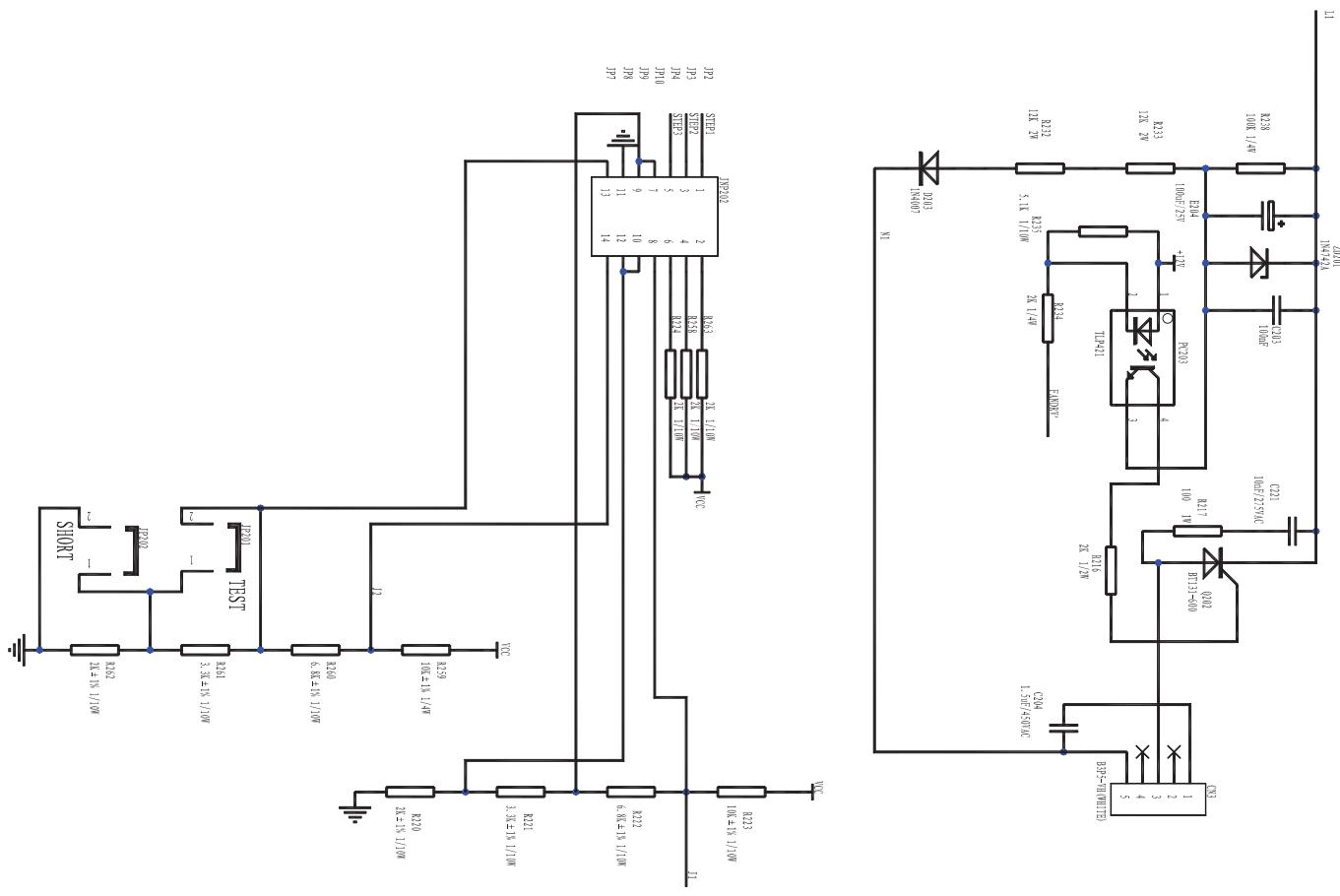
#### 1.1. Electronic control circuit diagram



AY-X9PSR/AY-X12PSR



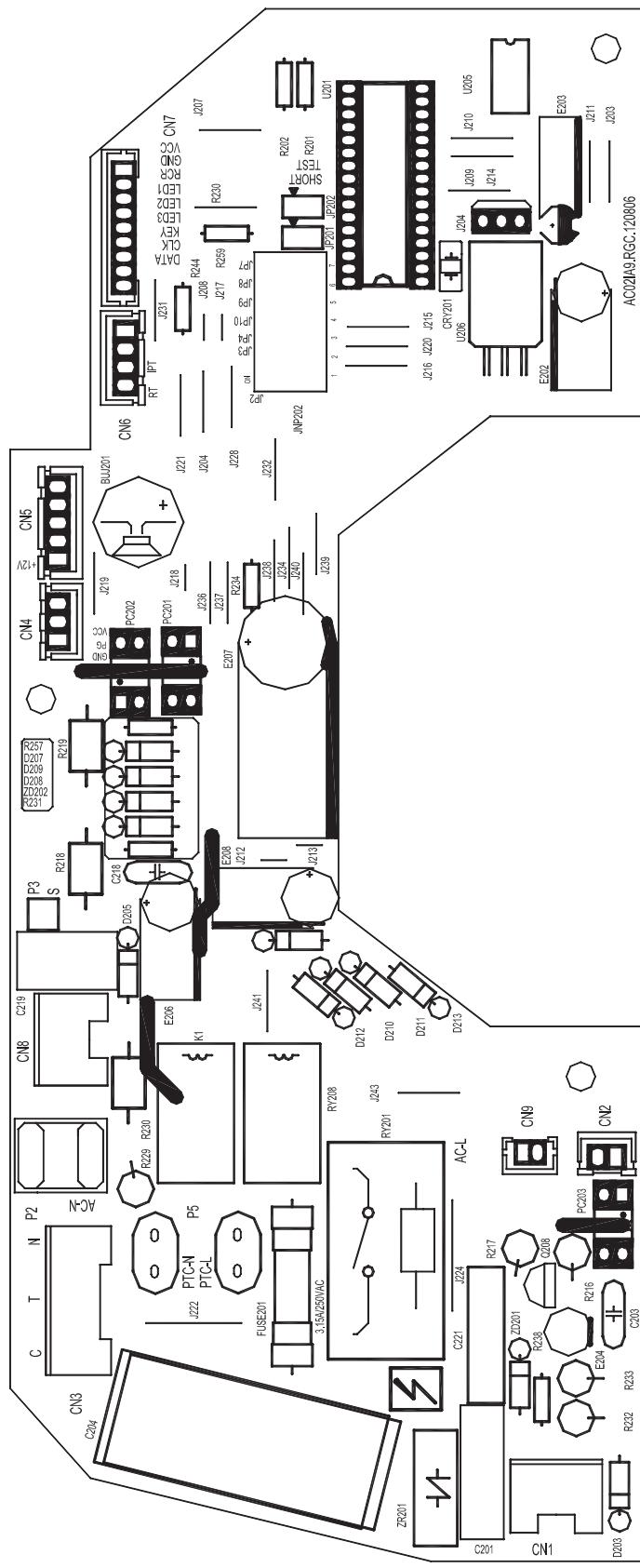




**AY-X9PSR/AY-X12PSR**

## **1.2. Printed wiring board**

## **Indoor unit**

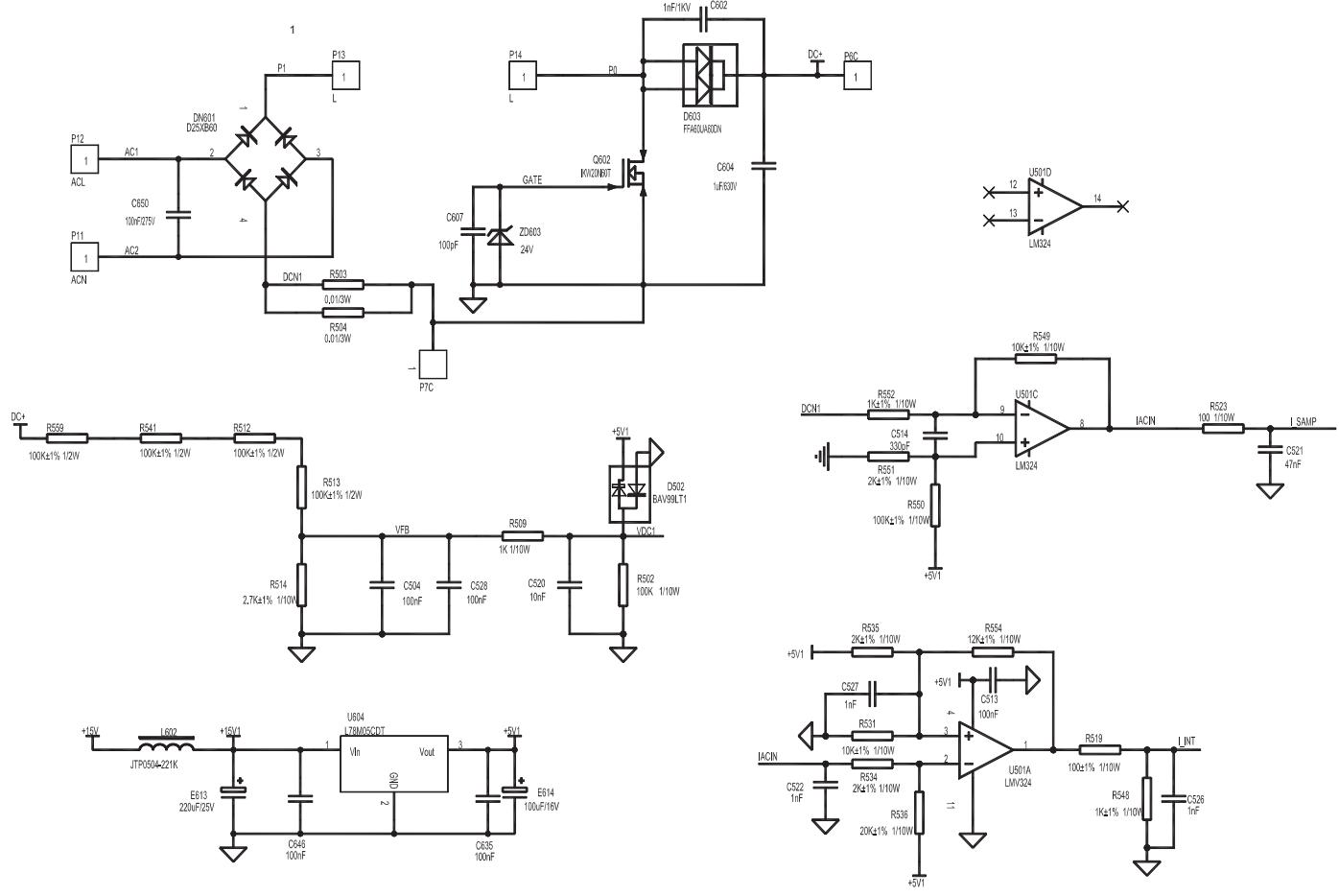


**AY-X9PSR/AY-X12PSR**

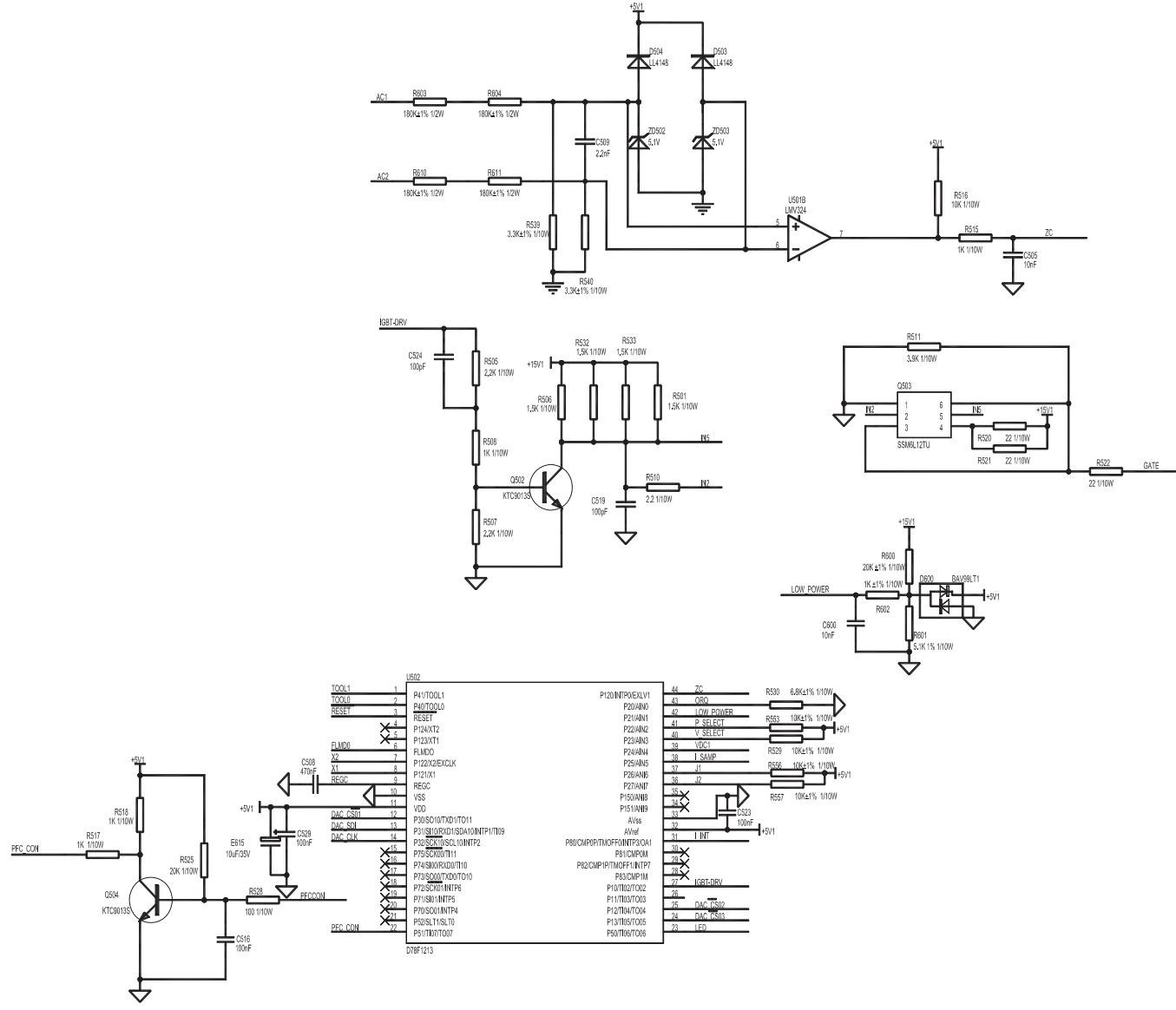
## **2. Outdoor unit**

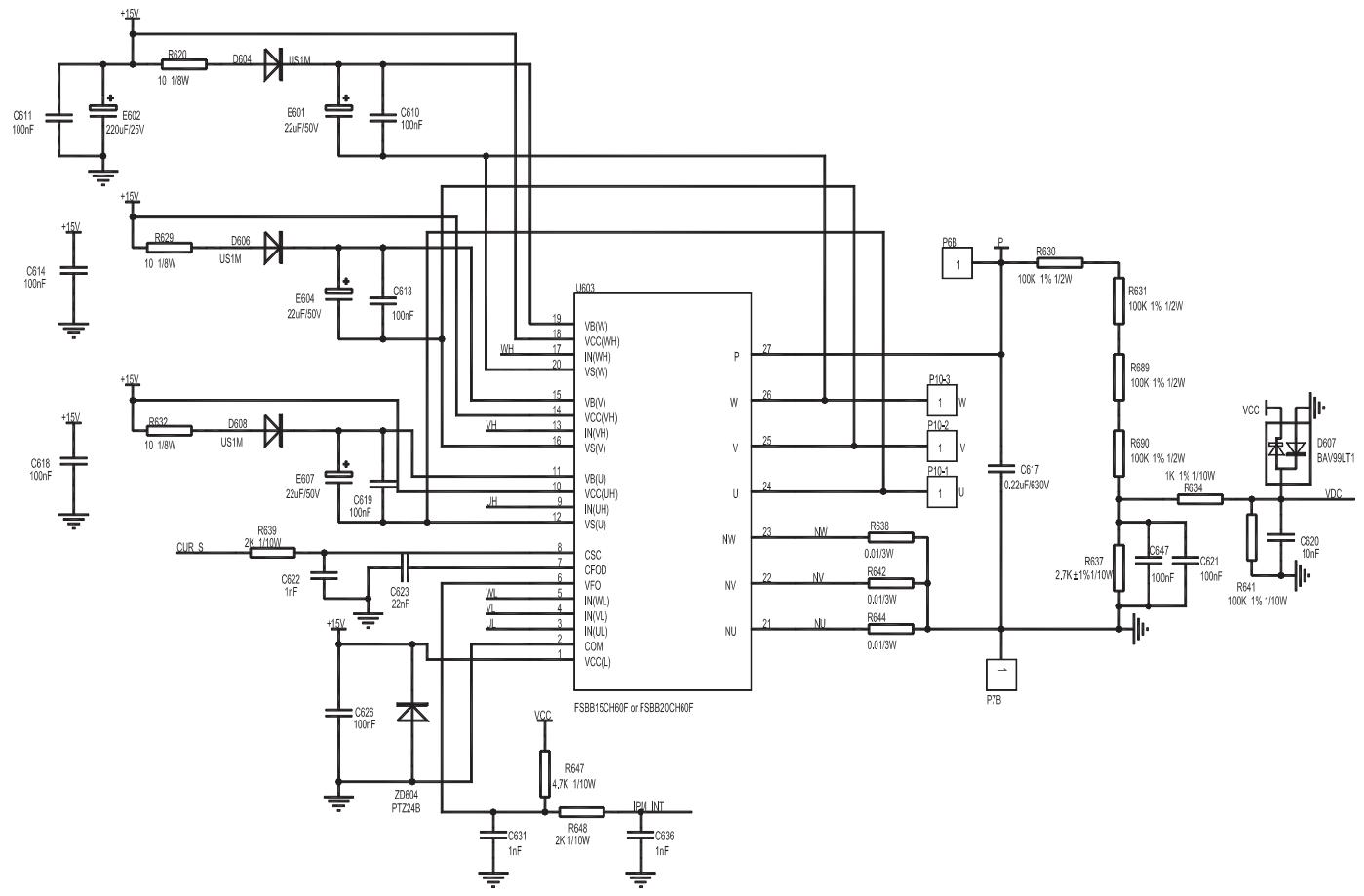
## **2.1. Electronic control circuit diagram**

**inverter modul board**

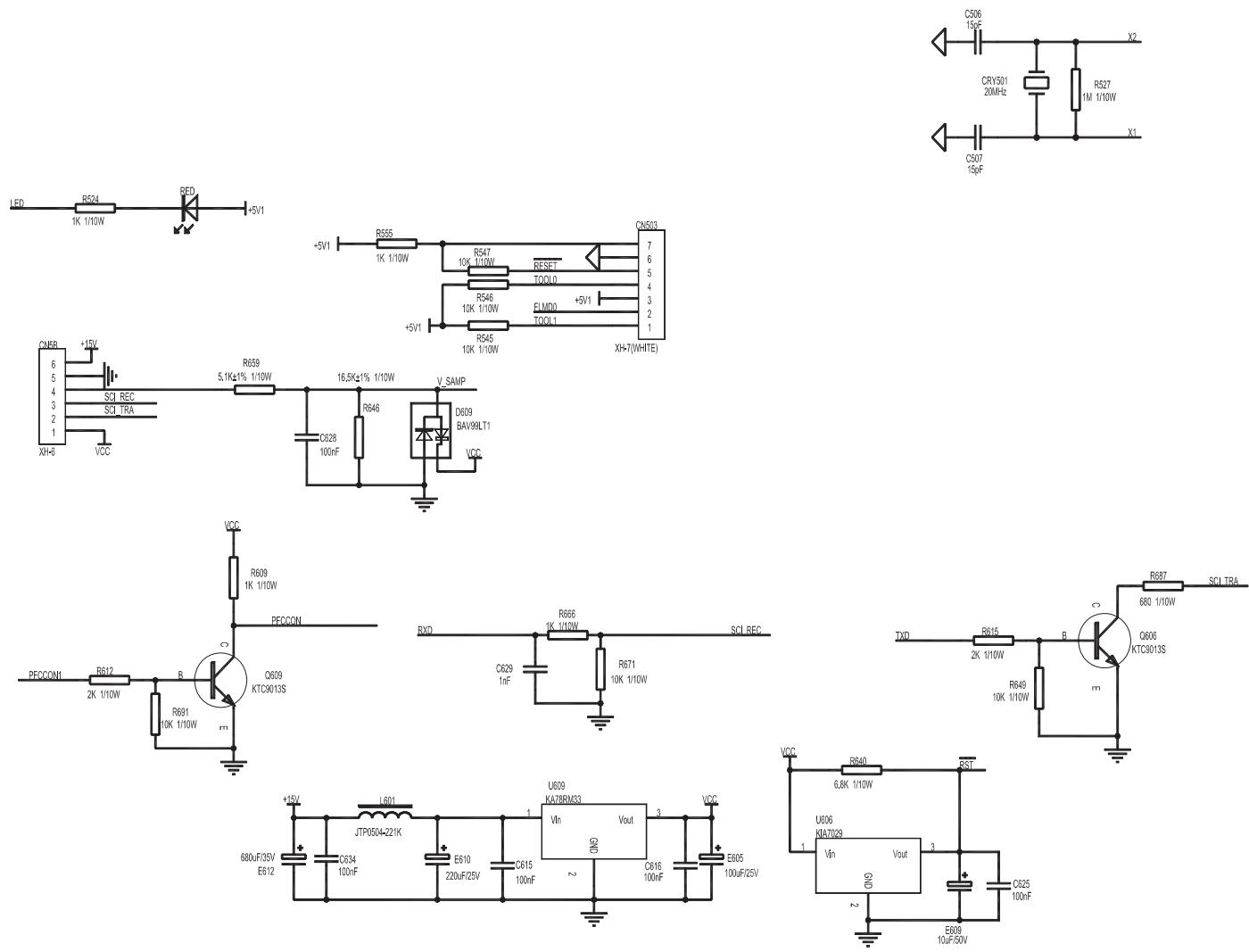


AE-X9PSR/AE-X12PSR

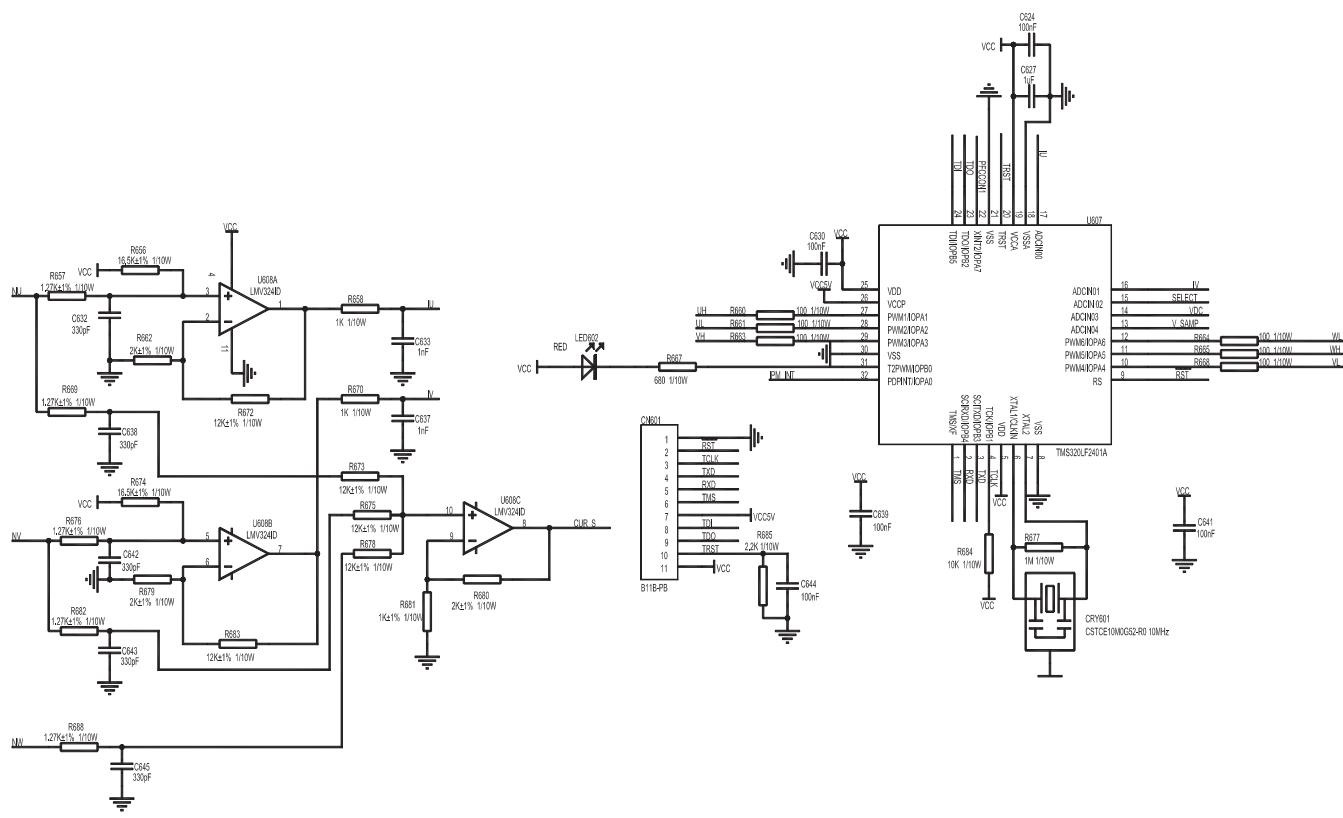




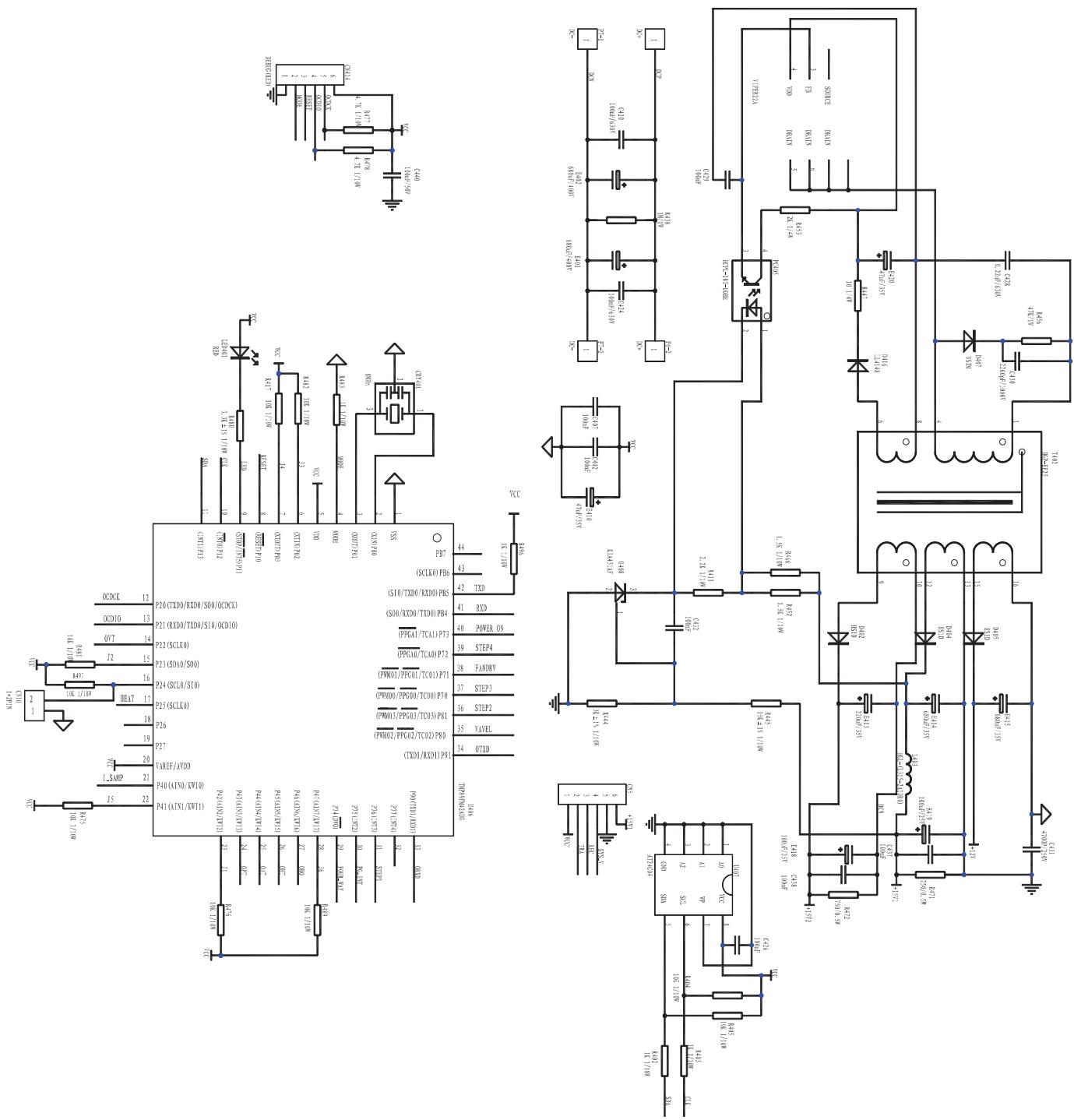
**AE-X9PSR/AE-X12PSR**



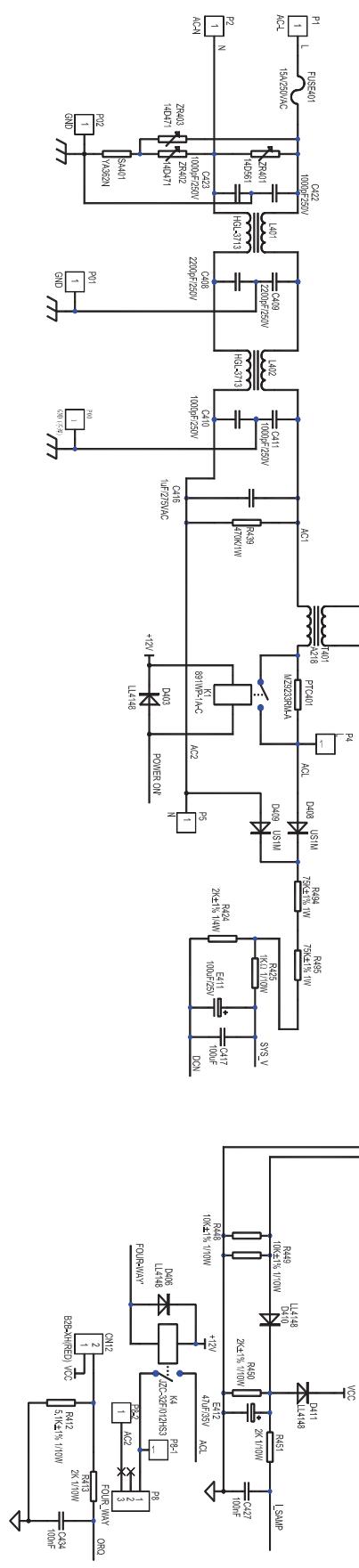
AE-X9PSR/AE-X12PSR



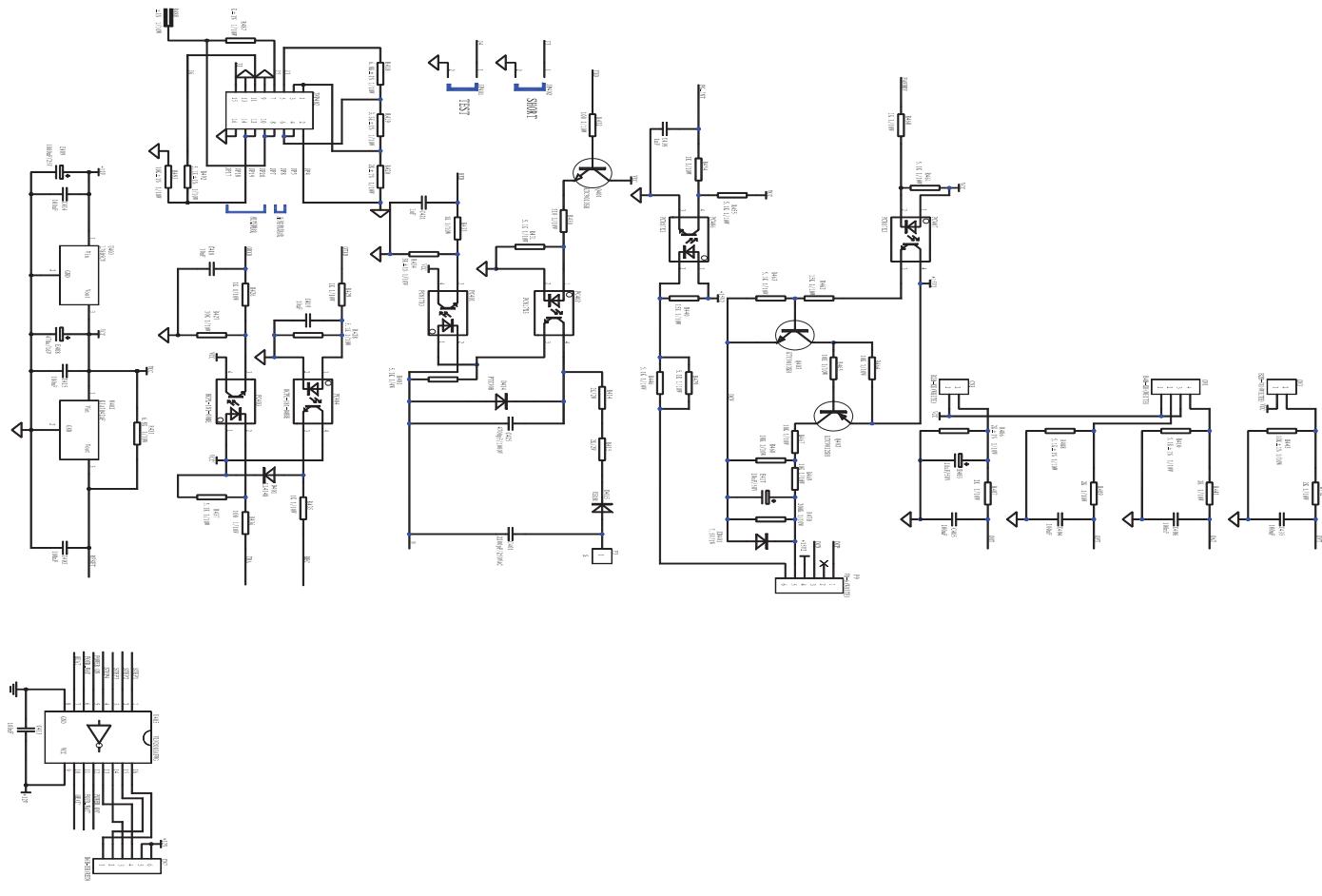
AE-X9PSR/AE-X12PSR



AE-X9PSR/EX-X12PSR



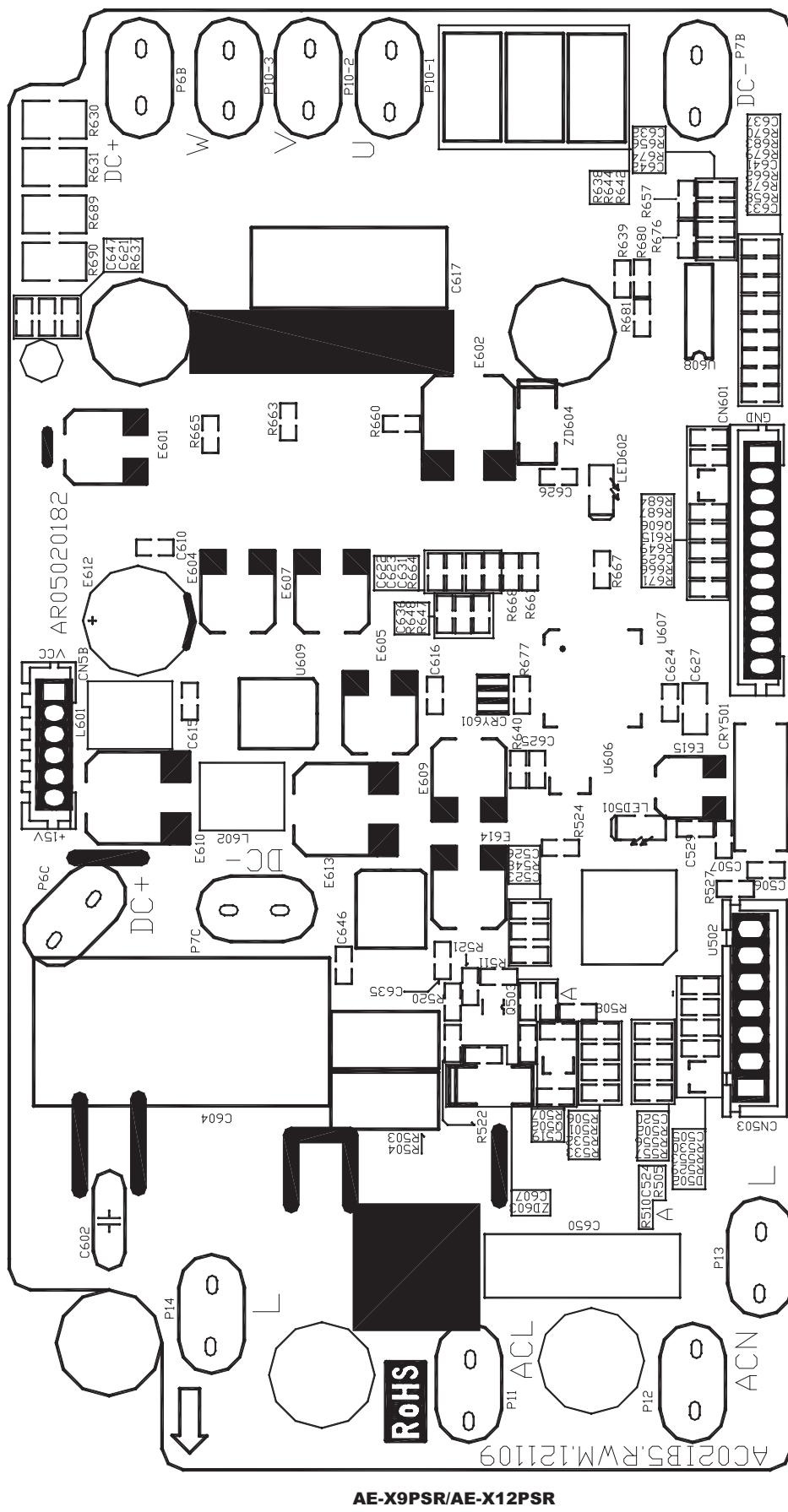
AE-X9PSR/EX-X12PSR



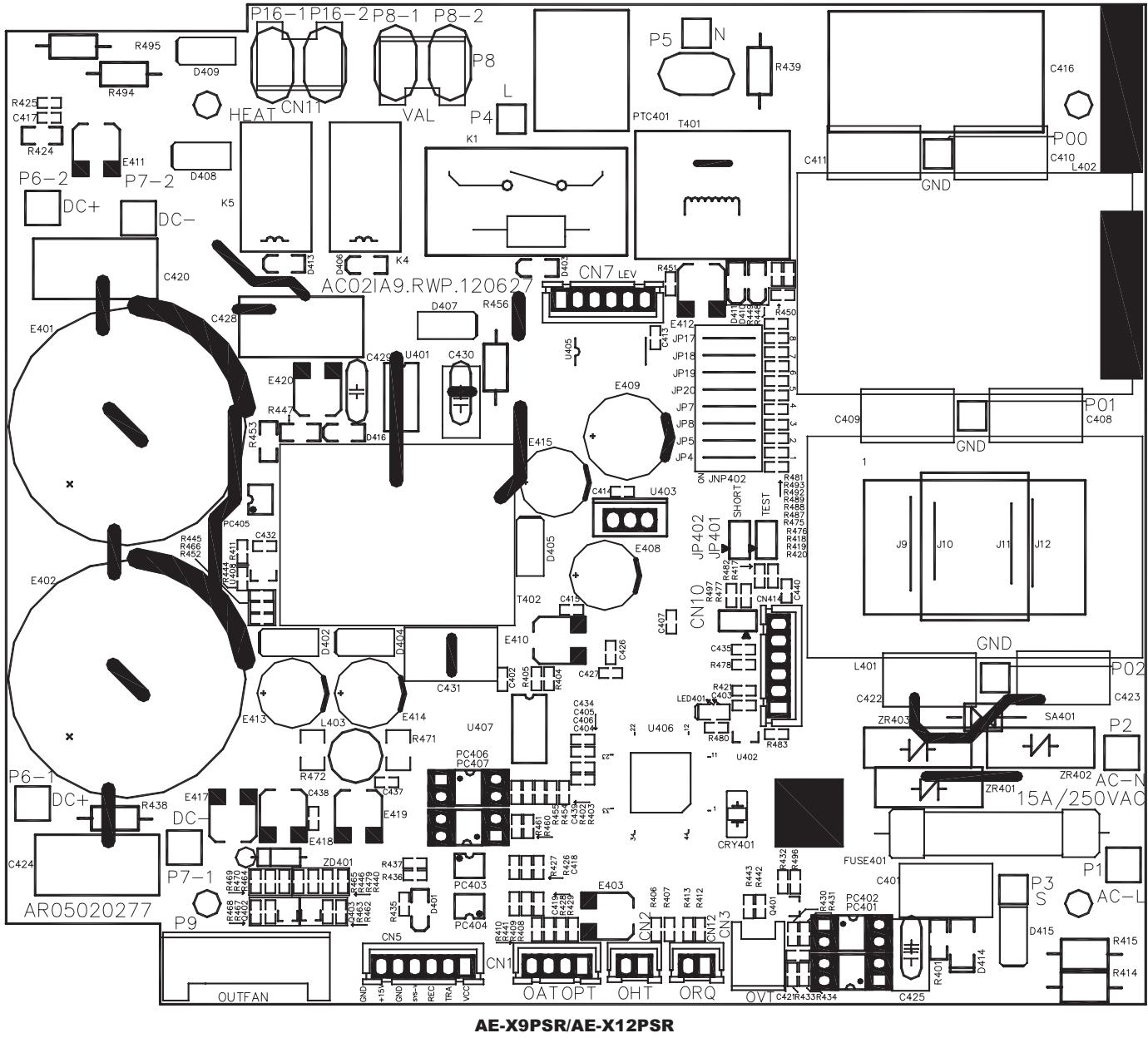
**AE-X9PSR/EX-X12PSR**

## **2.2 Printed wiring board**

## Inverter module board



## **POWER SUPPLY BOARD**



## [3] FUNCTION

### 1. Fuction

#### 1.1. Compressor delay operate

TheOnce the compressor stops operating, it will not restart for 3 minutes to protect the compressor

Therefore, if the operating compressor is shut down from the remote control and then turned back on immediately after, the compressor will restart after a preset delay time.

#### 1.2. Four-way valve control in heating model

When the unit operates in heating model, the compressor start-up after the four-way valve start up for 5 seconds, the four-way valve shut down after the compressor stops for 2 minutes when the unit shut down

#### 1.4.ON timer

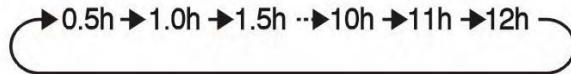
The ON timer can be activated by pressing the ON timer button.when the ON timer is activated, the operation start time is adjusted base on fuzzy logic calculations 1hour before the set time so that the room temperature reaches the set temperature at the set time.

#### 1.5. OFF timer

The OFF timer can be activated by pressing the OFF timer button.

- When the OFF timer is set, the operation stops after the set time.
- When the temperature is set during timer setting, the temperature will show in the display for 5 seconds and then return to the timer display.

Timer duration can be set from a minimum half an hour to a maximum of12 hours. Up to 9.5 hours, you can set in half-hour increments, and from10 to 12 hours, in 1hour increments.



#### 1.6. ON/OFF operation

If the air conditioner is off, you can pressing the ON/OFF button to operates cooling or heating mode. Presses the ON/OFF button, when the buzzer sounds 1 short sound then enter cooling operation, 2 short sounds enter heating operation, 1 long sound shut down the unit.

The unit operates in the set mode in the first 10 minutes of ON/OFF operation, in the first 10 minutes, the indoor fan speed operates on high speed, the vane swings, the compressor operates at maximum frequency F4. In cooling operation, the set temperature automatically 1°C lower than room temp., in heating mode the set temp. automatically 1°C higher than room temp., then the set temperature set at 23°C after 10 minutes, the maximum operating frequency is F7.

#### 1.7.Auto restart

Will automatically restart in the same setting which were active before the power failure.

##### 1.7.1. Operating mode at auto restart(Cool, Heat, Dry)

- Temperature adjustment (within 2°C range) automatic operation
- Temperature setting
- Fan setting

- Air flow direction
- Power ON/OFF
- Automatic operation mode setting
- Swing louvre

#### 1.7.2. Setting not memorized

- Timer setting

#### 1.7.3. Active auto restart and disabling auto restart function

If the auto restart wasn't activated,you can presse the ON/OFF switch and then supply the power and keep 10 seconds(the buzz sound 3 sounds) to actives it.

Contrary, if the auto restart has actived, you can press the ON/OFF switch and then supply the power and keep until 4beeps sound to disable it.

#### 1.8. FULL POWER Operation

The airconditioner works at the maximum power to make the room cool or warm rapidly

- The remote control will display " " button
- The temperature display will go off.
- The yellow FULL POWER lamp " " on.

#### TO CANCEL

Press the FULL POWER button again.

The yellow FULL POWER lamp " " on the unit will turn off

#### NOTE

- The airconditioner will operate at "Extra HIGH" fan speed for 5 minUtes, and then shift to "HIGH" fan speed.
- You can not set the temperature or fan speed during the FULL POWER operation.

#### 1.9. compressor discharge overheat prevention control

When the compressor discharge temperature $\geq$ TP2(95°C), forbid the frequency raise until the discharge temperature is bellow than TP2 decrease 2°C.

When the discharge temperature $\geq$ TP3(100°C), drop the operating frequency. If discharge temperature is over 105°C, then shut-down the compressor, outdoor fan motor stop after 15 seconds, when the discharge temperature $<$ TP2(95°C) and the compressor is stoped for 3 minutes, the unit operates again.

#### 1.10. Voltage prevention

When the voltage AC $\leq$  158V, the uint stops and displays the code P1 until the voltage AC $\geq$ 162V , when the voltage AC $\geq$ 265V and keeps 30 minutes, the unit stops and displays code P1 until the voltage AC $\leq$  260V.

#### 1.11. Over current prevention

- when the outdoor current $\geq$ I<sub>drop</sub> frequency,the controller drops1Hz/second until the minimum operation frequency.

- when the unit enter drop frequency prevention ooperates, if  $I_{drop} \geq I_{outdoor} \geq I_{normal}$ , the controller limit the operation frequency rise until  $I_{outdoor} < I_{normal}$ .
- When the outdoor current  $\geq I_{max}$ , the compressor stops and outdoor motor stops after 15 seconds

### 1.12. Compressor drive prevention

During the compressor start up or operation, if the signal of the compressor can't be checked or check the load is exceptional or driver fail then shut down the outdoor unit and displays the fail code.

### 1.13. Indoor unit evaporator freeze prevention

When the indoor evaporator temperature  $IPT \leq 4^\circ\text{C}$  and keeps 1 minutes, the unit enter the evaporator freeze prevention. If the indoor evaporate temperature  $IPT \leq -1^\circ\text{C}$  and remains 5 minutes during cooling or dry operation, the compressor stops in order to prevent the freezer and displays code P5.

When the indoor unit evaporator temperature  $IPT \geq 6^\circ\text{C}$ , the compressor restarts and resumes normal operation.

### 1.14. Outdoor unit overheat prevention

During cooling operation, if the temperature of the outdoor unit heat-exchanger OPT exceeds the limit frequency rise temperature TOP2, the controller limit the operation frequency rise until the  $OPT < TOP2$ .

If the temperature of the outdoor unit heat-exchanger OPT reach or exceeds stops unit temperature TOP4, the compressor stop operating,until  $OPT \leq TOP1$ (prevention cancel temperature), the unit restart and operates at normal.

### 1.15. Indoor unit overheat prevention control

During heating operation, if the temperature of the indoor unit heat-exchanger IPT exceeds the limit frequency rise temperature TIP2, the controller limits the operation frequency rise until the  $IPT < TIP2$ .

If the temperature of the outdoor unit heat-exchanger IPT reaches or exceeds stops unit temperature TIP4, the compressor stops operating and displays code P7,until  $IPT \leq TIP1$ (prevention cancel temperature), the unit restart and operates at normal.

### 1.16. IPM protector

If the IPM checked the temperature itself or current is higher than prevent temperature or current, the controller shuts down the outdoor unit and displays code P0, when the IPM temperature or current drops to lower than prevention temperature, the outdoor unit restarts and operates at normal.

### 1.17. Startup control

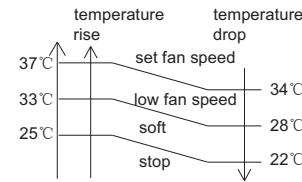
When the air conditioner starts in the cooling or heating mode, if the room temperature is  $3.5^\circ\text{C}$  higher than the set temperature, the unit operates with the operating frequency at maximum. Then, when the set temperature is reached, the unit operates at the operating frequency determined by fuzzy logic calculation, then enters the normal control mode after a while.

### 1.18. Cold air prevention control

When the air conditioner starts up in heating mode, the indoor unit fan will not operate until the temperature of the indoor unit heat exchanger reaches

about  $33^\circ\text{C}$  in order to prevent cold air from blowing into the room.

Also, the indoor unit fan operates at low speed until the temperature of the indoor unit heat exchanger reaches about  $37^\circ\text{C}$  so that people in the room will not feel chilly air flow.



### 1.19. Auto restart

When power failure occurs, after power is recovered, the unit will automatically restart in the same setting which auto restart function were active before the power failure, except for timer settings.

If a power failure occurs while the timer is set, the timer setting will be cancelled and will not be retrieved even after the power is restored.

### 1.20. Defrosting

Defrosting is controlled by the microprocessor.

#### 1.20.1. conditions of defrosting

The defrost operation starts when one of the following conditions is satisfied, the unit will come into defrosting. When the defrost operation starts, if the indoor exchange temperature less than  $34^\circ\text{C}$ , the indoor unit fan stops.

- outdoor heat exchanger Temperature (OPT) is continuously up to or less than  $3^\circ\text{C}$  while the unit runs for more than 40 minutes, and OPT is keep under  $-6^\circ\text{C}$  for more than 3 minutes.
- Outdoor heat exchanger Temperature (OPT) is continuously up to or less than  $3^\circ\text{C}$  meanwhile the unit runs for more than 80 minutes, and OPT is keep under  $-4^\circ\text{C}$  for more than 3 minutes.
- Outdoor heat exchanger Temperature (OPT) is continuously up to or less than  $3^\circ\text{C}$  while the unit runs for more than 120 minutes, and OPT is keep below  $-2^\circ\text{C}$  for more than 3 minutes.
- Once in the heating mode, if the outdoor heat exchanger temperature(OPT) keep lower than  $0^\circ\text{C}$  and outdoor temperature higher than  $3^\circ\text{C}$ , also the compressor operates for more than 20 minutes and the outdoor heat exchanger Temperature (OPT) reaches  $-6^\circ\text{C}$  or less and keeps 3 minutes, enter the first defrost.

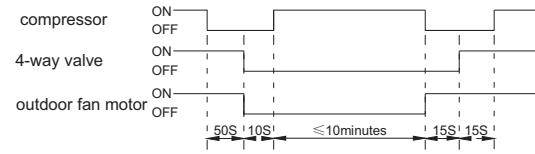
The defrost operation stops when the outdoor unit heat-exchanger temperature rises to about  $15^\circ\text{C}$  or higher or the defrosting time exceeds 10 minutes.

#### 1.20.2. Compressor operation frequency

Before the air conditioner comes into defrosting, compressor running frequency drops down to a lower frequency firstly, then the compressor shuts down.

In defrosting, the max. frequency of compressor is F9, in this period all protection functions are available.

#### 1.20.3 The part operation order.



### 1.21. Information about auto mode.

In the AUTO mode, the temperature setting and mode are automatically selected according to the room temperature when the unit is turned on.

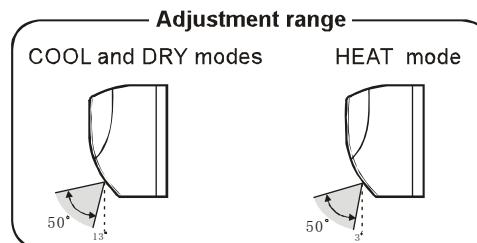
| Model   | Initial Room Temperature | Initial Set Temperature |
|---------|--------------------------|-------------------------|
| COOLING | RT≥26°C                  | 23°C                    |
| DRY     | 26°C>RT≥20°C             | RT-2                    |
| HEATING | RT<20°C                  | 23°C                    |
| FAN     | RT<20°C                  | -                       |

- In the "AUTO" model, when the controller receives the up or down signals of temperature from remote control, the set temperature can be adjusted by 1°C upper or lower. The maximum you can adjust by 2°C upper or lower.

- If the "AUTO" mode operates in DRY, the set temperature and the fan speed can't be changed.

### 1.22. Airflow control

- Press the SWING button, the vertical air flow louver will swing.
- Press the SWING button again to stop at the desired position.



### 1.23. Difference relating to set temperature

|                            | Auto mode  |         |        | Manual mode  |  |  |
|----------------------------|--|---------|--------|--|--|--|
|                            | Cooling  | Heating | Drying | Cooling  | Heating  | Drying   |
| Temperature setting method | Automatic temperature setting based on outside air temperature. Can be changed within ±2°C using remote control. |         |        | Can be changed between 18 and 32°C using remote control. | Can be changed between 18 and 32°C using remote control. | Automatic setting. Can be changed within ±2°C. |

### 1.24. Drying operation control

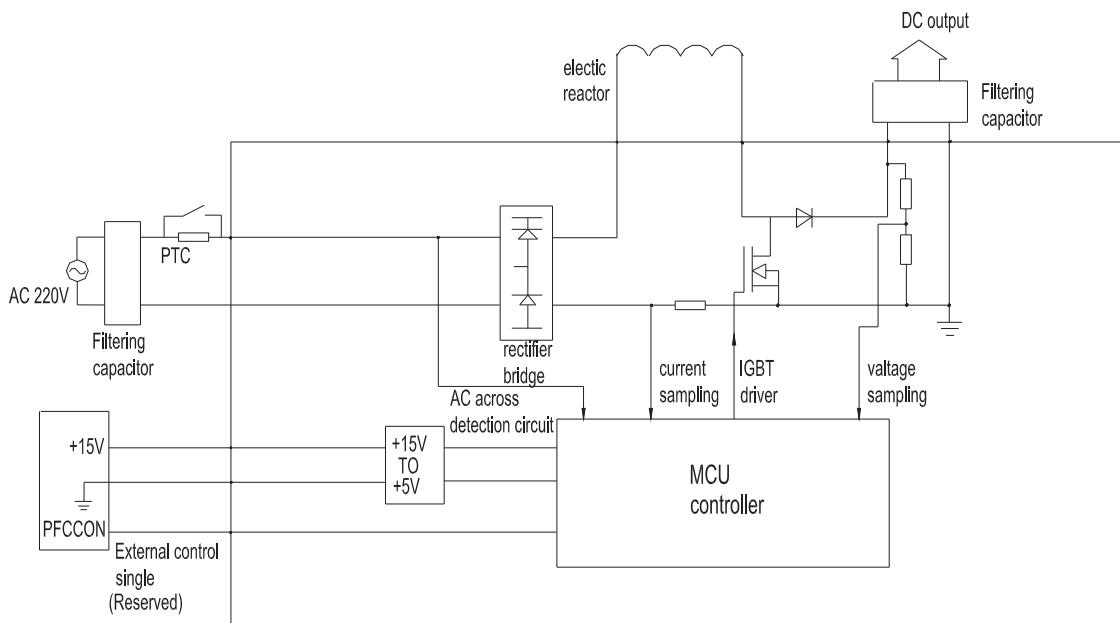
When the unit operates in drying mode, the set temperature is set and keep at room temperature decrease 2°C, and you can not adjusted it.

## 2. Outline of PWM (Pulse Width Modulation) circuit

### 2.1. Power Factor Correction(PFC)

The PFC circuit varies the compressor drive voltage and controls the rotation speed of the compressor.

The IGBT shown in the block diagram charges the energy (electromotive force) generated by the reactor to the electrolytic capacitor for the inverter by turning ON and OFF.



When the IGBT is ON, an electric current flows to the IGBT via the reactor.

When the IGBT turns OFF, the energy stored while the IGBT was ON is charged to capacitor.

As such, by varying the ON/OFF duty of the IGBT, the output voltage is varied.

This circuit brings the operating current waves form closer to the waveform of commercial power supply voltage to maintain a high power factor.

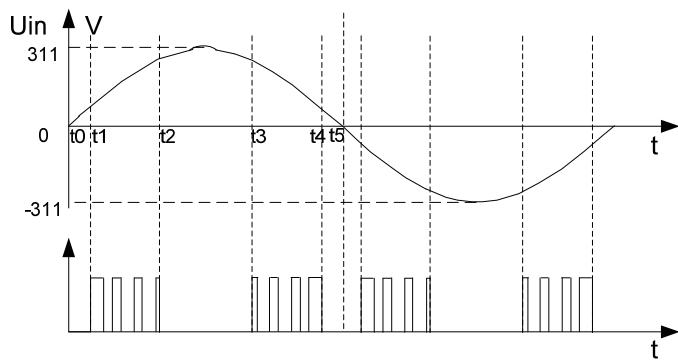
Because of the capacitor input, when the PFC circuit is OFF, the phase of the current waveform deviates from the voltage waveform.

The IGBT turns ON after the time length determined by the zero-cross point to supply a current to the IGBT via the reactor.

This brings the current waveform closer to the voltage wave form in phase.

As described above, the ON/OFF operation of the IGBT controls maintain a high power factor by keeping the current phase closer to that of the supply voltage.

## 2.2 Detailed explanation of PFC drive circuit sequence



t0~t1: IGBT Off, to detect the voltage Zero-crossing;

t1~t2: IGBT PWM (20KHz), to improve current waveform closer to voltage waveform;

t2~t3: IGBT Off;

t3~t4: IGBT PWM (20KHz), to improve current waveform closer to voltage waveform;

t4~t5: IGBT Off, to detect the voltage Zero-crossing;

The detected clock waveform is used to judge the power source frequency (50Hz/60Hz).

## 3. Explanation of IPM drive circuit

The IPM for compressor drive is made by Fairchild.

The power supply for the IPM drive, the shunt resistance for over current detection, etc., are provided outside the IPM (control PCB).

### 3.1. IPM drive power supply circuit

The power supply for the upper-phase IGBT (HU, HV, HW) drive employs a bootstrap system, and provides power to the upper-phase IC.

The 15-V power supply for the lower-phase IC is provided by the control printed circuit board (PCB).

#### 3.1.1 Brief explanation of bootstrap system (single power drive system)

To supply power to the upper-phase IC, the microcomputer (IC1) turns ON the lower-phase IGBT (LU, LV, LW).

This results in a charging current that flows to the electrolytic capacitor of each upper-phase IC input and charges the bootstrap capacitor with a 15V current

The power supply for the subsequent stages is charged while the lower-phase IGBT is ON in ordinary compressor drive control.

#### -Bootstrap Circuit Design

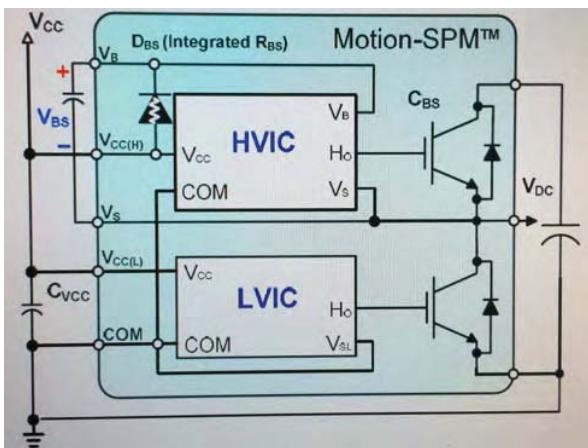
Operation of Bootstrap Circuit

The  $V_{BS}$  voltage difference between  $V_{B(U,V,W)}$  and  $V_{S(U,V,W)}$ , provides the supply to the HVIC within the μMini-DIP SPM package family in Motion-SPM products. This supply must be in the range of 13.0V~18.5V to ensure that the HVIC can fully drive the high-side IGBT. The μMini-DIP SPM package includes an under-voltage lockout protection for the  $V_{BS}$  to ensure that the HVIC does not drive the high-side IGBT, if the  $V_{BS}$  voltage drops below a specific voltage(refer to the datasheet).This function prevents the IGBT from operating in a high-dissipation mode.

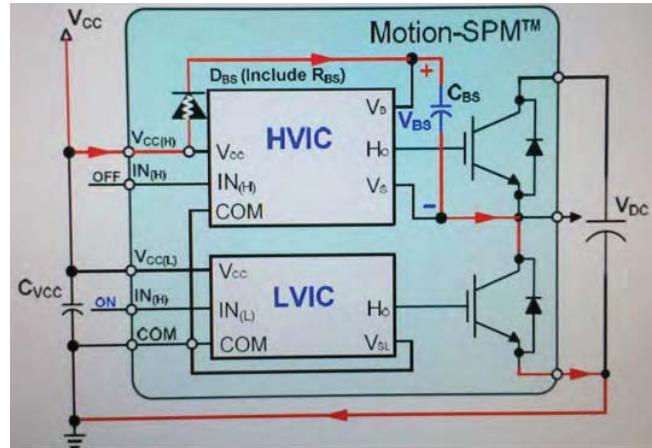
The  $V_{BS}$  Floating supply can be generated a number of ways, including the bootstrap method described here (refer to Figure 34).This method has the

advantage of being simple and inexpensive; however, the duty cycle and on-time are limited by the need to refresh the charge in the bootstrap capacitor.

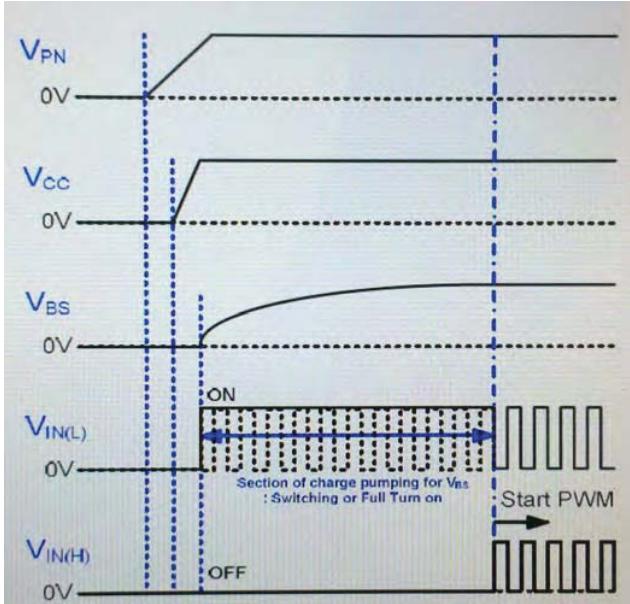
The bootstrap supply is formed by a combination of and bootstrap diode, resistor, and capacitor as shown in Figure35 and Figure36. The current flow path of the bootstrap circuit is show in Figure 35. When  $V_s$  is pulled down to ground (either through the low-side or the load), the bootstrap capacitor  $C_{BS}$  is charged through the bootstrap diode ( $D_{BS}$ ) and the resistor ( $R_{BS}$ ) from the  $V_{CC}$  supply.



(Figure 34)



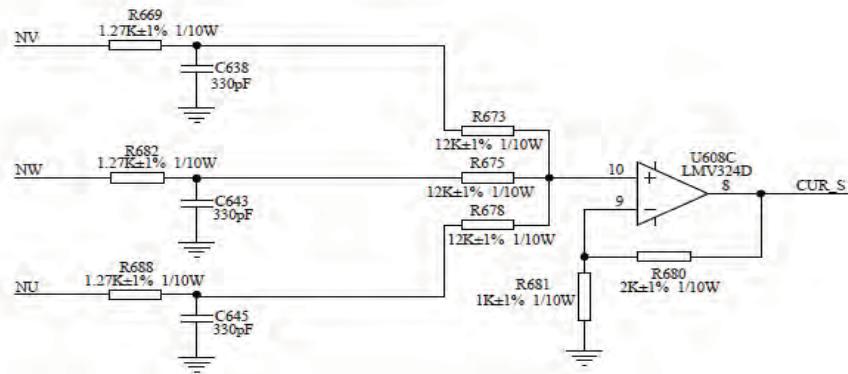
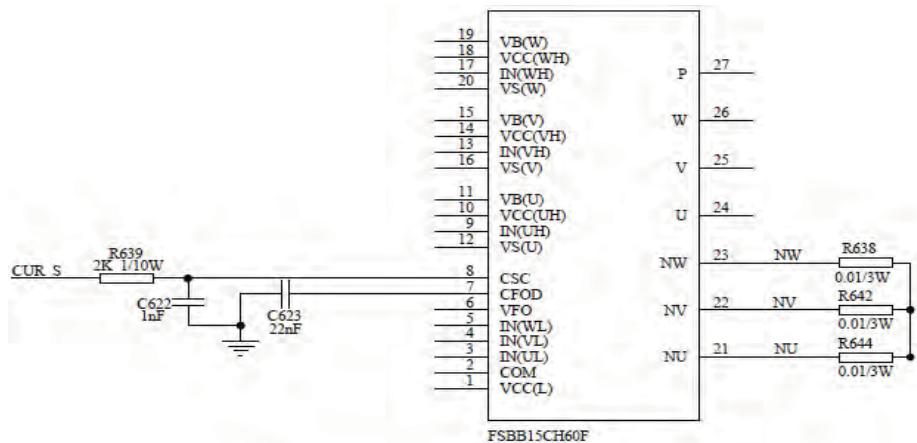
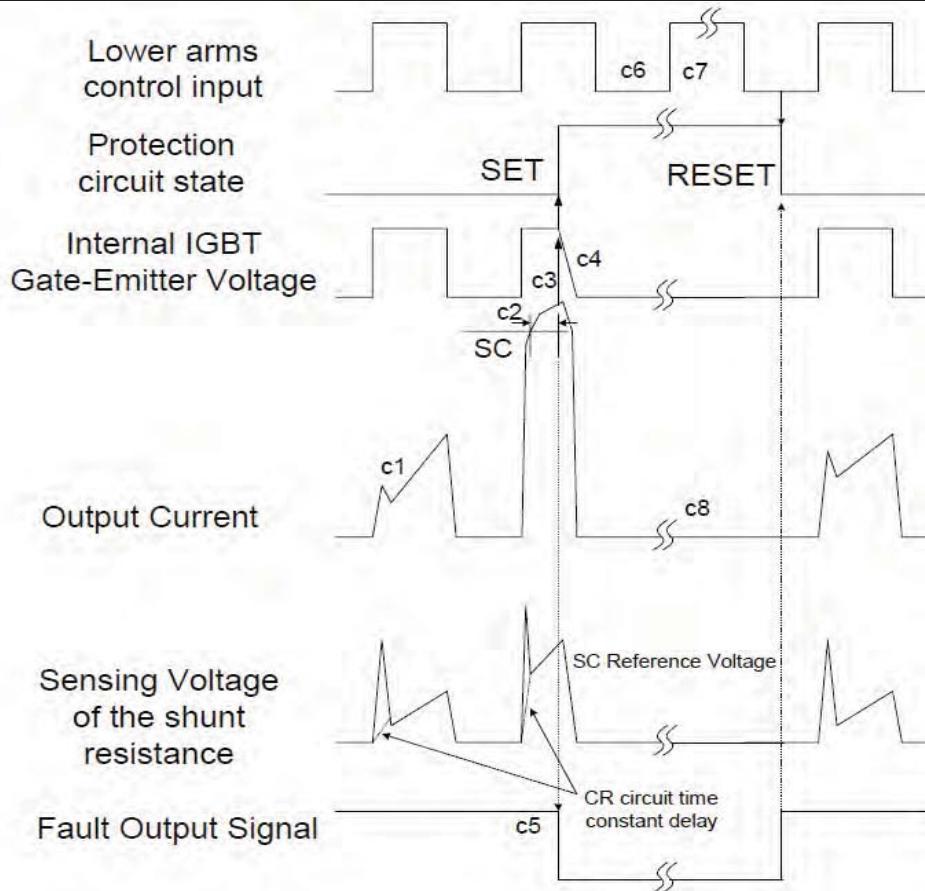
(Figure 35)



(Figure 36)

### 3.1.2 Compressor over current detection circuit

When a current of about 25 A or higher flows through the shunt resistance (R638,R642,R644) on the control printed circuit board (PCB), the voltage at this resistance is input to IPM CSC pin (8). Then the gate voltage of the lower-phase IGBT (LU, LV, LW) inside the IPM turns OFF to cut off the over current. At the same time, an L output of about 2ms is generated from IPM VFO pin (6), and this results in an L input to overcurrent detection input VFO of the microcomputer and turns OFF the PWM signal output through to the IGBT gate.



## CHAPTER 3. FUNCTION AND OPERATION OF PROTECTIVE PROCEDURES

### [1] PROTECTION DEVICE FUNCTIONS AND OPERATIONS

| FUNCTION  |  | Operation  |  |   |                               | Self-diagnosis result display |              |
|-----------|--|--|--|---|-------------------------------|-------------------------------|--------------|
|           |  | Description  | Detection period                           | Reset condition   | Indoor unit error display     | Indoor unit                   | Outdoor unit |
| <b>1</b>  | Compressor discharge over heat shut-down                           | Discharge temperature≥TP2 (95°C), forbid the frequency raise.<br>Discharge temperature≥TP3 (100°C), drop the operating frequency. If discharge temperature over 105°C, shut-down the compressor, outdoor fan motor stops after 15 seconds. | When compressor is in operation            | Discharge temperature is below than TP2-2°C.<br>Discharge temperature < TP2(95°C).<br>Discharge temperature < TP1(90°C) and after compressor stops for 3 minutes. | P4                            | none                          | yes          |
| <b>2</b>  | Compressor delay operation   | The compressor delays 3 minutes to restart   | When the compressor stops                  | The compressor stops for 3 minutes  | none                          | none                          | none         |
| <b>3</b>  | Lower voltage prevention   | The unit stops if AC ≤ 158V  | When the unit is in operation              | When AC≥162V  | P1                            | none                          | yes          |
| <b>4</b>  | Higher voltage prevention  | The unit stops if AC≥265V  | When the machine is in operation           | When AC≤260V  | P1                            | none                          | yes          |
| <b>5</b>  | Over current   | When the outdoor current ≥I <sub>max</sub> , the compressor stops and outdoor motor stops after 15 seconds   | When the machine is in operation           | When the outdoor current<I normal   | P2                            | none                          | yes          |
| <b>6</b>  | Compressor drive   | If the system can't check the feed-back signal of compressor or load is exceptional or driver fail then shut down the outdoor unit   | When the compressor drives or operates.    | Operation off/on  | P9                            | none                          | yes          |
| <b>7</b>  | Indoor unit evaporator freeze prevention                           | Compressor stops if indoor pipe temperature IPT≤-1 °C and remains 5minutes   | When in cooling or dehumidifying operation | Automatic reset when indoor pipe temperature IPT ≥6 °C and remains 10 minutes   | P5                            | none                          | yes          |
| <b>8</b>  | Outdoor unit overheat prevention                                   | Compressor stops if the outdoor unit heatexchanger temperature OPT≥TOP4  | When the unit is in operation              | When the outdoor pipe temperature OPT≤TOP1  | P6 outdoor light flash 5cycle | none                          | yes          |
| <b>9</b>  | Indoor unit overheat prevention                                    | Compressor stops if indoor exchaege temperature IPT≥TIP4   | When the unit is in operation              | When the indoor pipe temperature IPT≤TIP1   | P7                            | yes                           | none         |
| <b>10</b> | IPM protector  | The outdoor unit shutt down if the IPM checks the temperature of IPM itself or the current is too high   | When the unit is in operation              | When the IPM chck the temperature of IPM itself or the current fall to normal   | P0                            | none                          | yes          |
| <b>11</b> | Outdoor unit heat exchanger thermistor short-circuit               | Indoor and outdoor unit stops if there is short-circuit or break in outdoor unit heat exchanger thermistor   | At compressor startup                      | Operation OFF or ON   | E3                            | yes                           | yes          |
| <b>12</b> | Outdoor unit outside air temperature thermistor open-circuit error | Indoor and outdoor unit stops if there is short-circuit or break in outdoor unit heat exchanger thermistor   | At compressor startup                      | Operation OFF or ON   | E8                            | yes                           | yes          |

|           |  | Description  | Detection period                      | Reset condition                        | Indoor unit error display | Indoor unit | Outdoor unit |
|-----------|--|--|---------------------------------------|--|---------------------------|-------------|--------------|
| <b>13</b> | Outdoor unit discharge thermistor open-circuit error                 | Indoor and outdoor unit stops if there is short-circuit or break in outdoor unit heat exchanger thermistor | At compressor startup                 | Operation OFF or ON                    | E3                        | yes         | yes          |
| <b>14</b> | Outdoor unit outside air temperature ther-mistor short-circuit error | Indoor and outdoor unit stops if there is short-circuit or break in outdoor unit heat exchanger thermistor | At compressor startup                 | Operation OFF or ON                    | E8                        | yes         | yes          |
| <b>15</b> | Discharge pipe temperature themister short-circuit error             | Indoor and outdoor unit stops if there is short-circuit or break in outdoor unit heat exchanger thermistor | At compressor startup                 | Operation OFF or ON                    | E8                        | yes         | yes          |
| <b>16</b> | Discharge pipe temperature themister open-circuit error              | Indoor and outdoor unit stops if there is short-circuit or break in outdoor unit heat exchanger thermistor | At compressor startup                 | Operation OFF or ON                    | E8                        | yes         | yes          |
| <b>17</b> | Serial signal error  | Indoor and outdoor unit stops if outdoor unit cannot receive serial signal from indoor unit for 2minutes.  | When in operation                     | Reset after reception of serial signal | E0                        | yes         | yes          |
| <b>18</b> | Outdoor unit DC fan error  | Operation stops if there is no input of rotation pulse signal from out-door unit fan motor for 30 seconds  | When outdoor unit fan is in operation | Operation OFF or ON                    | EF                        | yes         | yes          |

## [2] AIR CONDITIONER OPERATION IN THERMISTOR ERROR

### 1. Indoor unit

| Item  | Mode              | Control operation                         | When resistance is low (tempera-ture judged higher than actual)   | Short-circuit  | When resistance is high (tempera-ture judged lower than actual) | Open-circuit   |
|---|-------------------|---|---|----------------|---|----------------|
| Room tempe-<br>rature ther-<br>mistor (TH1) | Auto              | Operation mode judgment                   | Cooling mode is activated even if room temperature is low.        | The unit stops | Heating mode is activated even if room temperature is high.     | The unit stops |
|   | Cooling           | Frequency con-<br>trol                    | Room becomes too cold   | The unit stops | Room does not become cool.                                      | The unit stops |
|   | Dehumidifying     | Room temperature memory frequency control | Normal operation.   | The unit stops | Normal operation.   | The unit stops |
|   | Heating           | Frequency control                         | Room does not become warm   | The unit stops | Room becomes too warm.  | The unit stops |
| Heat exchanger<br>thermistor (TH2)          | Cooling<br>Drying | Freeze prevention                         | Indoor unit evaporator may freeze.                                | The unit stops | Compressor stops occasionally.                                  | The unit stops |
|   | Heating           | Cold air prevention                       | Cold air prevention deactivates too soon and cold air discharges. | The unit stops | Cold air prevention deactivates too slow.                       | The unit stops |

### 2. Outdoor unit

| Item                                       | Mode                         | Control operation                                 | When resistance is low (temperature judged higher than actual)                         | Short-circuit   | When resistance is high (temperature judged lower than actual)                    | Open-circuit  |
|--|------------------------------|---|--|---|---|---|
| Compressor discharge pipe thermistor (TH1) | Cooling<br>Drying<br>Heating | Expansion valve control and compressor protection | Compressor operates, but room does not become cool or warm                             | Compressor discharge pipe temperature error indication. | Layer short-circuit or open-circuit may result in compressor in normal operation. | Compressor discharge pipe temperature error indication. |
| Heat exchanger thermistor (TH2)            | Cooling<br>Drying            | Outdoor unit heat exchanger over heat prevention  | Compressor operates at low speed or stops.   | Outdoor unit thermistor short-circuit error indication. | Normal operation.   | Outdoor unit thermistor open-circuit error indication.  |
|  | Heating                      | Expansion valve control Defrosting                | Defrosting operation is not activated as needed, and frost accumulates on outdoor unit | Outdoor unit thermistor short-circuit error indication. | Defrosting operation is activated unnecessarily, and room does not become warm    | Outdoor unit thermistor short-circuit error indication. |
| Outside air temperature thermistor (TH3)   | Auto                         | Operation mode judgement                          | Cooling mode is activated even if room temperature is low.                             | Outdoor unit thermistor short-circuit error indication. | Heating mode is activated even if room temperature is high.                       | Outdoor unit thermistor open-circuit error indication.  |
|  | Cooling<br>Drying            | Operation not affected                            | Normal operation.  | Outdoor unit thermistor short-circuit error indication. | Normal operation.   | Outdoor unit thermistor open-circuit error indication.  |
|  | Heating                      | Rating controlDefrosting                          | Defrosting operation is activated unnecessarily.                                       | Outdoor unit thermistor short-circuit error indication. | Defrosting operation is not activated, and frost accumulates on outdoor unit.     | Outdoor unit thermistor open-circuit error indication.  |

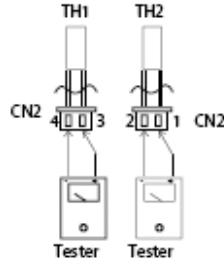
### [3] THERMISTOR TEMPERATURE CHARACTERISTICS

#### 1. Indoor unit and outdoor exchange temperature and outside air temperature thermistor temperature characteristics

| TEMP. | Resistance (k Ohm) | Votalge of resistiance | TEMP. | Resistance (k Ohm) | Votalge of resistiance | TEMP. | Resistance (k Ohm) | Votalge of resistiance |
|-------|--------------------|------------------------|-------|--------------------|------------------------|-------|--------------------|------------------------|
| -30   | 63.513             | 4.628                  | 15    | 7.447              | 2.968                  | 60    | 1.464              | 1.115                  |
| -29   | 60.135             | 4.609                  | 16    | 7.148              | 2.918                  | 61    | 1.418              | 1.088                  |
| -28   | 56.956             | 4.589                  | 17    | 6.863              | 2.868                  | 62    | 1.374              | 1.061                  |
| -27   | 53.963             | 4.568                  | 18    | 6.591              | 2.819                  | 63    | 1.331              | 1.035                  |
| -26   | 51.144             | 4.547                  | 19    | 6.332              | 2.769                  | 64    | 1.290              | 1.009                  |
| -25   | 48.488             | 4.524                  | 20    | 6.084              | 2.720                  | 65    | 1.250              | 0.984                  |
| -24   | 45.985             | 4.501                  | 21    | 5.847              | 2.671                  | 66    | 1.212              | 0.960                  |
| -23   | 43.627             | 4.477                  | 22    | 5.621              | 2.621                  | 67    | 1.175              | 0.936                  |
| -22   | 41.403             | 4.452                  | 23    | 5.404              | 2.572                  | 68    | 1.139              | 0.913                  |
| -21   | 39.305             | 4.426                  | 24    | 5.198              | 2.524                  | 69    | 1.105              | 0.890                  |
| -20   | 37.326             | 4.399                  | 25    | 5.000              | 2.475                  | 70    | 1.072              | 0.868                  |
| -19   | 35.458             | 4.371                  | 26    | 4.811              | 2.427                  | 71    | 1.040              | 0.847                  |
| -18   | 33.695             | 4.343                  | 27    | 4.630              | 2.379                  | 72    | 1.009              | 0.825                  |
| -17   | 32.030             | 4.313                  | 28    | 4.457              | 2.332                  | 73    | 0.979              | 0.805                  |
| -16   | 30.458             | 4.283                  | 29    | 4.292              | 2.285                  | 74    | 0.950              | 0.785                  |
| -15   | 28.972             | 4.252                  | 30    | 4.133              | 2.238                  | 75    | 0.922              | 0.765                  |
| -14   | 27.567             | 4.219                  | 31    | 3.981              | 2.192                  | 76    | 0.895              | 0.746                  |
| -13   | 26.239             | 4.186                  | 32    | 3.836              | 2.146                  | 77    | 0.869              | 0.728                  |

| TEMP. | Resistance<br>(k Ohm) | Votalge of<br>resisitance | TEMP. | Resistance<br>(k Ohm) | Votalge of<br>resisitance | TEMP. | Resistance<br>R(k Ohm) | Votalge of<br>resisitance |
|-------|-----------------------|---------------------------|-------|-----------------------|---------------------------|-------|------------------------|---------------------------|
| -12   | 24.984                | 4.152                     | 33    | 3.697                 | 2.101                     | 78    | 0.843                  | 0.710                     |
| -11   | 23.795                | 4.117                     | 34    | 3.563                 | 2.057                     | 79    | 0.819                  | 0.692                     |
| -10   | 22.671                | 4.082                     | 35    | 3.435                 | 2.012                     | 80    | 0.795                  | 0.675                     |
| -9    | 21.606                | 4.045                     | 36    | 3.313                 | 1.969                     | 81    | 0.773                  | 0.658                     |
| -8    | 20.598                | 4.008                     | 37    | 3.195                 | 1.926                     | 82    | 0.751                  | 0.641                     |
| -7    | 19.644                | 3.969                     | 38    | 3.082                 | 1.883                     | 83    | 0.729                  | 0.625                     |
| -6    | 18.732                | 3.930                     | 39    | 2.974                 | 1.842                     | 84    | 0.709                  | 0.610                     |
| -5    | 17.881                | 3.890                     | 40    | 2.870                 | 1.800                     | 85    | 0.689                  | 0.595                     |
| -4    | 17.068                | 3.850                     | 41    | 2.770                 | 1.760                     | 86    | 0.669                  | 0.580                     |
| -3    | 16.297                | 3.808                     | 42    | 2.674                 | 1.720                     | 87    | 0.651                  | 0.566                     |
| -2    | 15.565                | 3.766                     | 43    | 2.583                 | 1.681                     | 88    | 0.633                  | 0.552                     |
| -1    | 14.871                | 3.723                     | 44    | 2.494                 | 1.642                     | 89    | 0.615                  | 0.538                     |
| 0     | 14.212                | 3.680                     | 45    | 2.410                 | 1.604                     | 90    | 0.598                  | 0.525                     |
| 1     | 13.586                | 3.635                     | 46    | 2.328                 | 1.567                     | 91    | 0.582                  | 0.512                     |
| 2     | 12.991                | 3.590                     | 47    | 2.250                 | 1.530                     | 92    | 0.566                  | 0.499                     |
| 3     | 12.426                | 3.545                     | 48    | 2.174                 | 1.495                     | 93    | 0.550                  | 0.487                     |
| 4     | 11.889                | 3.499                     | 49    | 2.102                 | 1.459                     | 94    | 0.535                  | 0.475                     |
| 5     | 11.378                | 3.452                     | 50    | 2.032                 | 1.425                     | 95    | 0.521                  | 0.463                     |
| 6     | 10.893                | 3.406                     | 51    | 1.965                 | 1.391                     | 96    | 0.507                  | 0.452                     |
| 7     | 10.431                | 3.358                     | 52    | 1.901                 | 1.357                     | 97    | 0.493                  | 0.441                     |
| 8     | 9.991                 | 3.310                     | 53    | 1.839                 | 1.325                     | 98    | 0.480                  | 0.430                     |
| 9     | 9.573                 | 3.262                     | 54    | 1.779                 | 1.293                     | 99    | 0.467                  | 0.419                     |
| 10    | 9.174                 | 3.214                     | 55    | 1.721                 | 1.262                     | 100   | 0.455                  | 0.409                     |
| 11    | 8.795                 | 3.165                     | 56    | 1.666                 | 1.231                     |       |                        |                           |
| 12    | 8.433                 | 3.116                     | 57    | 1.613                 | 1.201                     |       |                        |                           |
| 13    | 8.089                 | 3.067                     | 58    | 1.561                 | 1.172                     |       |                        |                           |
| 14    | 7.760                 | 3.017                     | 59    | 1.512                 | 1.143                     |       |                        |                           |

Resistance at 25°C: 5 kΩ.



TH1: indoor room temperature thermistor and outside air temperature thermistor

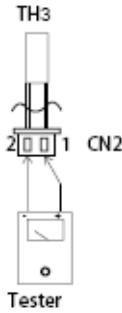
TH2: indoor exchange temperature themistor and outside exchange temperature thermistor

Before measuring resistance, disconnect connectors as shown above.

## 2. Outdoor unit thermistor temperature characteristics

| <b>TEMP.</b> | <b>Rmin<br/>(k Ohm)</b> | <b>R(t)<br/>(k Ohm)</b> | <b>Rmax<br/>(k Ohm)</b> | <b>TEMP.</b> | <b>Rmin<br/>(k Ohm)</b> | <b>R(t)<br/>(k Ohm)</b> | <b>Rmax<br/>(k Ohm)</b> | <b>TEMP.</b> | <b>Rmin<br/>(k Ohm)</b> | <b>R(t)<br/>(k Ohm)</b> | <b>Rmax<br/>(k Ohm)</b> |
|--------------|-------------------------|-------------------------|-------------------------|--------------|-------------------------|-------------------------|-------------------------|--------------|-------------------------|-------------------------|-------------------------|
| -30          | 283.3                   | 322.9                   | 367.7                   | 24           | 19.36                   | 20.89                   | 22.52                   | 78           | 2.563                   | 2.654                   | 2.745                   |
| -29          | 267.4                   | 304.4                   | 346.3                   | 25           | 18.55                   | 20                      | 21.54                   | 79           | 2.481                   | 2.567                   | 2.654                   |
| -28          | 252.5                   | 287.1                   | 307.4                   | 26           | 17.77                   | 19.14                   | 20.6                    | 80           | 2.402                   | 2.484                   | 2.567                   |
| -27          | 238.5                   | 270.9                   | 307.4                   | 27           | 17.03                   | 18.32                   | 19.7                    | 81           | 2.327                   | 2.404                   | 2.483                   |
| -26          | 225.4                   | 255.7                   | 289.8                   | 28           | 16.32                   | 17.55                   | 18.85                   | 82           | 2.254                   | 2.327                   | 2.401                   |
| -25          | 213.1                   | 241.4                   | 273.3                   | 29           | 15.65                   | 16.81                   | 18.04                   | 83           | 2.183                   | 2.253                   | 2.323                   |
| -24          | 201.5                   | 228                     | 257.9                   | 30           | 15                      | 16.1                    | 17.27                   | 84           | 2.115                   | 2.182                   | 2.248                   |
| -23          | 190.6                   | 215.5                   | 243.4                   | 31           | 14.39                   | 15.43                   | 16.54                   | 85           | 2.05                    | 2.113                   | 2.176                   |
| -22          | 180.3                   | 203.6                   | 229.8                   | 32           | 13.81                   | 14.79                   | 15.34                   | 86           | 1.985                   | 2.047                   | 2.109                   |
| -21          | 170.7                   | 192.5                   | 217                     | 33           | 13.25                   | 14.18                   | 15.17                   | 87           | 1.922                   | 1.983                   | 2.045                   |
| -20          | 161.6                   | 182.1                   | 205                     | 34           | 12.72                   | 13.6                    | 14.54                   | 88           | 1.861                   | 1.922                   | 1.983                   |
| -19          | 153.1                   | 172.3                   | 193.7                   | 35           | 12.21                   | 13.05                   | 13.93                   | 89           | 1.802                   | 1.862                   | 1.923                   |
| -18          | 145                     | 163.1                   | 183.2                   | 36           | 11.72                   | 12.52                   | 13.36                   | 90           | 1.746                   | 1.805                   | 1.865                   |
| -17          | 137.5                   | 154.4                   | 173.2                   | 37           | 11.26                   | 12.01                   | 12.81                   | 91           | 1.692                   | 1.75                    | 1.809                   |
| -16          | 130.3                   | 146.2                   | 163.9                   | 38           | 10.82                   | 11.53                   | 12.29                   | 92           | 1.639                   | 1.697                   | 1.755                   |
| -15          | 123.6                   | 138.5                   | 155.1                   | 39           | 10.29                   | 11.07                   | 11.78                   | 93           | 1.589                   | 1.646                   | 1.703                   |
| -14          | 117.3                   | 131.3                   | 146.8                   | 40           | 9.986                   | 10.63                   | 11.31                   | 94           | 1.54                    | 1.596                   | 1.653                   |
| -13          | 111.3                   | 124.4                   | 139                     | 41           | 9.6                     | 10.21                   | 10.85                   | 95           | 1.493                   | 1.549                   | 1.604                   |
| -12          | 105.6                   | 118                     | 131.7                   | 42           | 9.231                   | 9.813                   | 10.42                   | 96           | 1.448                   | 1.502                   | 1.558                   |
| -11          | 100.3                   | 111.9                   | 124.7                   | 43           | 8.878                   | 9.43                    | 10                      | 97           | 1.404                   | 1.458                   | 1.512                   |
| -10          | 95.24                   | 106.2                   | 118.2                   | 44           | 8.54                    | 9.064                   | 9.612                   | 98           | 1.362                   | 1.415                   | 1.469                   |
| -9           | 90.49                   | 100.8                   | 112.1                   | 45           | 8.217                   | 8.714                   | 9.233                   | 99           | 1.321                   | 1.373                   | 1.426                   |
| -8           | 85.99                   | 95.68                   | 106.3                   | 46           | 7.908                   | 8.38                    | 8.872                   | 100          | 1.284                   | 1.335                   | 1.387                   |
| -7           | 81.75                   | 90.86                   | 100.8                   | 47           | 7.612                   | 8.06                    | 8.526                   | 101          | 1.245                   | 1.296                   | 1.348                   |
| -6           | 77.74                   | 86.31                   | 95.74                   | 48           | 7.328                   | 7.754                   | 8.196                   | 102          | 1.209                   | 1.258                   | 1.309                   |
| -5           | 73.94                   | 82.01                   | 90.88                   | 49           | 7.057                   | 7.461                   | 7.88                    | 103          | 1.173                   | 1.222                   | 1.272                   |
| -4           | 70.35                   | 77.95                   | 86.29                   | 50           | 6.797                   | 7.18                    | 7.578                   | 104          | 1.139                   | 1.187                   | 1.236                   |
| -3           | 66.96                   | 74.11                   | 81.96                   | 51           | 6.548                   | 6.912                   | 7.289                   | 105          | 1.105                   | 1.153                   | 1.202                   |
| -2           | 63.74                   | 70.48                   | 77.87                   | 52           | 6.309                   | 6.655                   | 7.013                   | 106          | 1.073                   | 1.12                    | 1.168                   |
| -1           | 60.69                   | 67.05                   | 74                      | 53           | 6.08                    | 6.409                   | 6.748                   | 107          | 1.042                   | 1.089                   | 1.136                   |
| 0            | 57.81                   | 63.8                    | 70.34                   | 54           | 5.861                   | 6.173                   | 6.495                   | 108          | 1.013                   | 1.058                   | 1.104                   |
| 1            | 55.08                   | 60.72                   | 66.88                   | 55           | 5.651                   | 5.947                   | 6.253                   | 109          | 0.9833                  | 1.028                   | 1.074                   |
| 2            | 52.49                   | 57.81                   | 63.61                   | 56           | 5.449                   | 5.73                    | 6.02                    | 110          | 0.9553                  | 0.9997                  | 1.045                   |
| 3            | 50.03                   | 55.05                   | 60.52                   | 57           | 5.255                   | 5.522                   | 5.798                   | 111          | 0.9283                  | 0.9719                  | 1.016                   |
| 4            | 47.71                   | 52.44                   | 57.59                   | 58           | 5.07                    | 5.323                   | 5.585                   | 112          | 0.9021                  | 0.9451                  | 0.9892                  |
| 5            | 45.5                    | 49.97                   | 54.82                   | 59           | 4.891                   | 5.132                   | 5.381                   | 113          | 0.8765                  | 0.9191                  | 0.9626                  |
| 6            | 43.41                   | 47.62                   | 52.2                    | 60           | 4.72                    | 4.949                   | 5.101                   | 114          | 0.8524                  | 0.894                   | 0.9367                  |
| 7            | 41.42                   | 45.4                    | 49.71                   | 61           | 4.556                   | 4.774                   | 4.997                   | 115          | 0.8087                  | 0.8595                  | 0.9117                  |
| 8            | 39.53                   | 43.2                    | 42.33                   | 62           | 4.398                   | 4.605                   | 4.817                   | 116          | 0.8059                  | 0.8461                  | 0.8875                  |
| 9            | 37.74                   | 41.29                   | 45.12                   | 63           | 4.247                   | 4.448                   | 4.644                   | 117          | 0.7837                  | 0.8233                  | 0.8641                  |
| 10           | 36.04                   | 39.39                   | 43.01                   | 64           | 4.101                   | 4.288                   | 4.479                   | 118          | 0.7623                  | 0.8012                  | 0.8413                  |
| 11           | 34.42                   | 37.59                   | 41                      | 65           | 3.961                   | 4.139                   | 4.32                    | 119          | 0.7415                  | 0.7798                  | 0.8193                  |
| 12           | 32.89                   | 35.87                   | 39.1                    | 66           | 3.827                   | 3.995                   | 4.167                   | 120          |                         |                         |                         |
| 13           | 31.43                   | 34.25                   | 37.29                   | 67           | 3.698                   | 3.858                   | 4.021                   | 121          | 0.702                   | 0.7386                  | 0.7773                  |

| <b>TEMP.</b> | <b>Rmin<br/>(k Ohm)</b> | <b>R(t)<br/>(k Ohm)</b> | <b>Rmax<br/>(k Ohm)</b> | <b>TEMP.</b> | <b>Rmin<br/>(k Ohm)</b> | <b>R(t)<br/>(k Ohm)</b> | <b>Rmax<br/>(k Ohm)</b> | <b>TEMP.</b> | <b>Rmin<br/>(k Ohm)</b> | <b>R(t)<br/>(k Ohm)</b> | <b>Rmax<br/>(k Ohm)</b> |
|--------------|-------------------------|-------------------------|-------------------------|--------------|-------------------------|-------------------------|-------------------------|--------------|-------------------------|-------------------------|-------------------------|
| 14           | 30.04                   | 32.71                   | 35.58                   | 68           |                         |                         |                         | 122          | 0.6631                  | 0.7195                  | 0.7572                  |
| 15           | 29.72                   | 31.24                   | 33.95                   | 69           |                         |                         |                         | 123          | 0.6649                  | 0.7007                  | 0.7378                  |
| 16           |                         |                         |                         | 70           | 3.339                   | 3.476                   | 3.616                   | 124          | 0.6472                  | 0.6824                  | 0.7189                  |
| 17           |                         |                         |                         | 71           | 3.229                   | 3.359                   | 3.491                   | 125          | 0.6301                  | 0.6647                  | 0.7006                  |
| 18           | 25.13                   | 27.26                   | 29.55                   | 72           | 3.122                   | 3.246                   | 3.372                   | 126          | 0.6135                  | 0.6476                  | 0.6829                  |
| 19           | 24.05                   | 26.07                   | 28.23                   | 73           | 3.02                    | 3.138                   | 3.257                   | 127          | 0.5974                  | 0.6309                  | 0.6657                  |
| 20           | 23.02                   | 24.93                   | 26.97                   | 74           | 2.921                   | 3.033                   | 3.146                   | 128          | 0.5818                  | 0.6148                  | 0.649                   |
| 21           | 22.04                   | 23.84                   | 25.77                   | 75           | 2.827                   | 2.933                   | 3.04                    | 129          | 0.5667                  | 0.5991                  | 0.6328                  |
| 22           | 21.1                    | 22.81                   | 24.63                   | 76           | 2.735                   | 2.836                   | 2.938                   | 130          | 0.5521                  | 0.5839                  | 0.6171                  |
| 23           | 20.21                   | 21.83                   | 23.55                   | 77           | 2.647                   | 2.743                   | 2.84                    |              |                         |                         |                         |
|              |                         |                         |                         |              |                         |                         |                         |              |                         |                         |                         |
|              |                         |                         |                         |              |                         |                         |                         |              |                         |                         |                         |

**R—Resistance****Rrsistance at 25°C :20 kΩ****TH3: Outdoor unit discharge pipe thermistor**

Before measuring resistance, disconnect connectors as shown above.

## [4] GENERAL TROUBLESHOOTING CHART

### 1. Indoor unit does not turn on

| <b>Main cause</b>                   | <b>Inspection method</b> | <b>Normal value/condition</b>                     | <b>Remedy</b> |
|-------------------------------------|--------------------------|---|---------------|
| Cracked PCB.<br>(Cracked pattern)   | Check visually.          | There should be no cracking in<br>PCB or pattern. | Replace PCB.  |
| Open-circuit in FU1 (250 V, 3.15A). | Check melting of FU1.    | There should be no open-circuit.                  | Replace PCB.  |

### 2. Indoor unit fan does not operate

| <b>Main cause</b>                               | <b>Inspection method</b>   | <b>Normal value/condition</b>                         | <b>Remedy</b>       |
|---|--|---|---------------------|
| Open-circuit in heat exchanger thermistor (TH2) | Measure thermistor resistance<br>(dismount for check).               | Refer to themistor temperature<br>characteristic      | Replace thermistor. |
|   |  | There should be no open-circuit<br>or faulty contact. | Replace thermistor. |
| Disconnected heat exchanger thermistor (TH2)    | Inspect connector on PCB.Check<br>thermistor installation condition. | Thermistor should not be<br>disconnected.             | Install correctly.  |

### 3. Indoor unit fan speed does not change

| Main cause   | Inspection method     | Normal value/condition  | Remedy           |
|--|-----------------------|---|------------------|
| Remote control not designed to allow fan speed change. | Check operation mode. | Fan speed should change except during dehumidifying operation, sleep operation, internally normal operation | Explain to user. |

#### 4. Remote control signal is not received

| Main cause  | Inspection method                                     | Normal value/condition  | Remedy   |
|---|---|---|--|
| Batteries at end of service life.                                   | Measure battery voltage.                              | 2.5 V or higher (two batteries in series connection)                            | Install new batteries.   |
| Batteries installed incorrectly.                                    | Check battery direction.                              | As indicated on battery compartment.  | Install batteries in indicated direction.                                    |
| Lighting fixture is too close, or fluorescent lamp is burning out.  | Turn off light and check.                             | Signal should be received when light is turned off.                             | Change light position or install new fluorescent lamp.                       |
| Operating position/angle is inappropriate.                          | Operate within range specified in manual.             | Signal should be received within range specified in manual.                     | Explain appropriate handling to user.  |
| Open-circuit or short-circuit in wiring of light receiving section. | Check if wires of light receiving section are caught. | Wires of light receiving section should not have any damage caused by pinching. | Replace wires of light receiving section.                                    |
| Defective light receiving unit.                                     | Check signal receiving circuit                        | Tester indicator should move when signal is received.                           | Replace PCB.   |
| Dew condensation on light receiving unit.                           | Check for water and rust.                             | Signal should be received within range specified in manual.                     | Take moisture-proof measure for lead wire outlet of light receiving section. |

#### 5. Vane do not move

| Main cause   | Inspection method                           | Normal value/condition                         | Remedy                              |
|--|---|--|-------------------------------------|
| Caught in sliding section.                                   | Operate to see if vane are caught in place. | Vane should operate smoothly.                  | Remove or correct catching section. |
| Disconnected connector (CN5 on relay PCB, louver motor side) | Inspect connectors.                         | Connectors or pins should not be disconnected. | Install correctly.                  |
| Contact of solder on PCB(connector section on PCB)           | Check visually.                             | There should not be solder contact.            | Correct contacting section.         |

#### 6. Compressor does not start

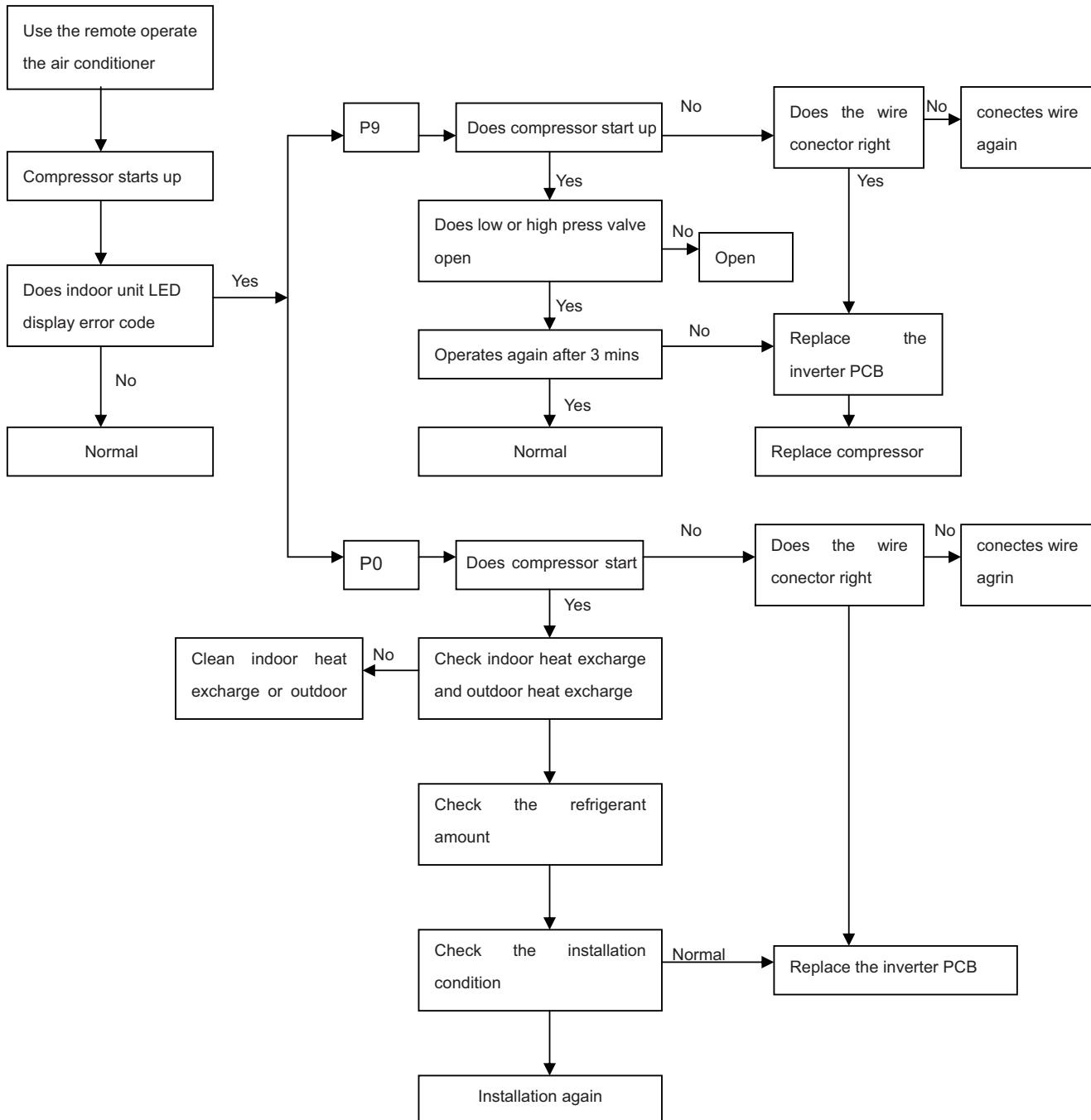
| Main cause                       | Inspection method                              | Normal value/condition             | Remedy          |
|----------------------------------|--|------------------------------------|-----------------|
| Erroneous inter-unit connection. | Check wiring between indoor and outdoor units. | Terminal board 1-N: 230 VAC, 50 Hz | Correct wiring. |
| Damaged IPM                      | Check IPM continuity                           |                                    | Replace IPM     |

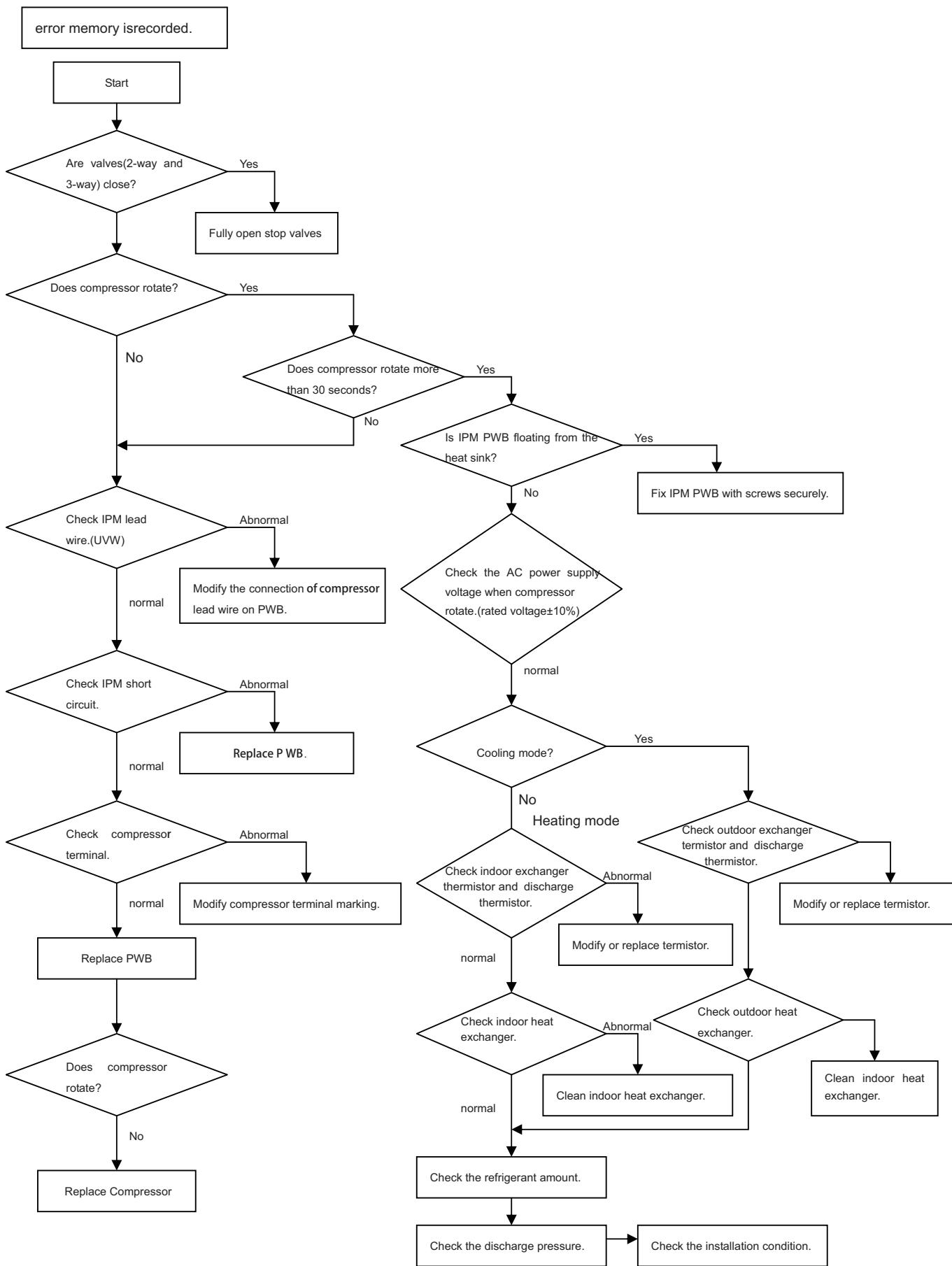
| Main cause                       | Inspection method  | Normal value/condition            | Remedy   |
|----------------------------------|--|-----------------------------------|--|
| Blown outdoor unit fuse.         | Check 20-A fuse. Check 15-A fuse.  | Fuse should not be blown.         | Replace fuse.<br>Replace outdoor unit PWB assembly.      |
| Power supply voltage is too low. | Measure power supply voltage during startup.   | 220± 10 VAC, 50 Hz                | Make sure that power supply voltage is 198 V or higher.  |
| Compressor lock.                 | Supply current and touch compressor cover (sound absorbing material) to check if operation starts. | Compressor should start normally. | Apply external impact to compressor. Replace compressor. |

## [5] MALFUNCTION (PARTS) CHECK METHOD

### 1. Procedure for determining defective outdoor unit IPM/compressor

The following flow chart shows a procedure for locating the cause of a malfunction when the compressor does not start up and a DC overcurrent indication error occurs.



**6. DC Over Current Error**

## [6] CHART

### 1. The failure code display(indoor unit)

| Fault Type  | Function Indicator lamp | Digital LED display |
|---|-------------------------|---------------------|
| Indoor/outdoor communication fault                  | RUN&POWER: ON           | E0 (Flashing)       |
| Outdoor communication fault                         | RUN&POWER: ON           | EC (Flashing)       |
| Room temperature sensor (IRT)                       | RUN&POWER: ON           | E1 (Flashing)       |
| Indoor pipe (coil) temperature sensor (IPT)         | RUN&POWER: ON           | E2 (Flashing)       |
| Outdoor pipe (coil) temperature sensor (OPT)        | RUN&POWER: ON           | E3 (Flashing)       |
| Model configuration wrong                           | RUN&POWER: ON           | E5 (Flashing)       |
| Indoor fan motor fault                              | RUN&POWER: ON           | E6 (Flashing)       |
| Outdoor air temperature sensor                      | RUN&POWER: ON           | E7 (Flashing)       |
| Discharge temperature sensor                        | RUN&POWER: ON           | E8 (Flashing)       |
| IPM of drive and module fault                       | RUN&POWER: ON           | E9 (Flashing)       |
| Outdoor fan motor fault (DC Motor)                  | RUN&POWER: ON           | EF (Flashing)       |
| Current sensor fault                                | RUN&POWER: ON           | EA (Flashing)       |
| EEPROM fault  | RUN&POWER: ON           | EE (Flashing)       |
| Temperature switch fault (on top of the compressor) | RUN&POWER: ON           | EP (Flashing)       |
| Voltage sensor fault                                | RUN&POWER: ON           | EU (Flashing)       |
| Intake temperature sensor                           | RUN&POWER: ON           | EH (Flashing)       |

### 2. The failure code display

#### 2.1. Outdoor power supply PCB (The lamp on the outdoor PCB)

| Blink times(n) | Fault Message   | Blink times(n) | Fault Message   |
|----------------|---|----------------|---|
| 1              | IPM protection  | 17             | Defrost state   |
| 2              | Ovvoltage / undervoltage  | 18             | Short-circuit / open-circuit fault of intake temperature sensor   |
| 3              | Over current  | 19             | Outdoor EEPROM fault  |
| 4              | Exhaust overtemperature protection  | 20             | Outdoor fan motor protection                                      |
| 5              | Outdoor coil overtemperature protection   | 21             | Indoor fan motor protection                                       |
| 6              | Drive faulture protection   | 23             | System in shortage of Freon                                       |
| 7              | Communication fault with indoor unit  | 24             | Model configuration wrong   |
| 8              | Compressor overheat fault (compressor top switch)                               | 25             | Indoor sensor fault   |
| 9              | Short-circuit / open-circuit fault of outdoor temperature sensor                | 26             | Indoor coil sensor fault  |
| 10             | Short circuit / open-circuit fault of outdoor heat exchanger temperature sensor | 27             | Indoor EEPROM fault   |
| 11             | Short-circuit / open-circuit fault of discharge temperature sensor              | 28             | Indoor fan motor fault  |
| 12             | Voltage sensor fault  | 30             | Outdoor drive fault   |
| 13             | Current sensor fault  | 31             | Outdoor environmental Overtemperature/undertemperature protection |
| 14             | IPM fault   | 32             | Indoor coil defrost prevention                                    |
| 15             | communication fault between power source board and intelligent power module     | 33             | Indoor coil overheating protection                                |
| 16             | No feedback from DC fan motor(outdoor unit)                                     |                |   |

## 2.2. Outdoor IPM

| <b>Flash times(n)</b> | <b>Fault Message</b>      | <b>Blink times(n)</b> | <b>Fault Message</b>  |
|-----------------------|---------------------------|-----------------------|---|
| 1                     | IPM protection/failure    | 13                    | The phase current of compressor failure                                     |
| 2                     | DC overhigh/lower voltage | 15                    | communication fault between power source board and intelligent power module |
| 3                     | Overcurrent of compressor |                       |   |

Display on outdoor power source board: The indicator alerts the fault in a cycle as such that it is bright for 0.5 seconds, dark for 0.5 seconds, flases "n" times and then dark for 3 seconds.

## 2.3. Protection Code

| <b>Protection Type</b>                     | <b>Function Indicator (flash)</b>    | <b>Digital LED display</b> |
|--|--------------------------------------|----------------------------|
| Overvoltage / undervoltage protection      | RUN: Flaring ; TIMER: 1 time /8 sec  | P1                         |
| Overcurrent protection                     | RUN: Flaring; TIMER: 2 times /8 sec  | P2                         |
| Exhaust overtemperature protection         | RUN: Flaring; TIMER: 4 times /8 sec  | P4                         |
| Subcooling protection under cooling mode   | RUN: Bright; TIMER: 5 times /8 sec   | P5                         |
| Overheating protection under cooling mode  | RUN: Bright; TIMER: 6 times /8 sec   | P6                         |
| Overheating protection under heating mode  | RUN: Bright; TIMER: 7 times /8 sec   | P7                         |
| Outdoor over/ under temperature protection | RUN: Bright; TIMER: 8 times /8 sec   | P8                         |
| Drive protection (software control )       | RUN: Flaring; TIMER: 9 times /8 sec  | P9                         |
| Module protection (hardware control)       | RUN: Flaring; TIMER: 10 times /8 sec | P0                         |

## [7] Trouble shooting Guide

### According to the fault code

#### 1. Display E1 or E2

|                 |  |  |
|-----------------|--|--|
| Problem symptom |  | Display E1 or E2   |
| Cause           |  | Room temperature thermistor (IRT) and Indoor exchange temperature thermistor (IPT) fault         |
| Malfunction No. | Content of diagnosis   | Action   |
| 1               | Contact between indoor room and exchange temperature thermistor CN6 (RT, IPT) and slot   | Insert again if loose.   |
| 2               | Measure the resistance on the two ends of indoor temperature sensor: (25°C/ 5kΩ). For other resistance, please refer to the temperature – Resistance Sheet | Replace the temperature sensor if the resistance is incurred to drift, open or short circuiting. |
| 3               | If the above testing is normal   | Replace the indoor control board   |

**2. Display E6**

|                 |  |   |
|-----------------|--|---|
| Problem symptom |  | Display E6  |
| Cause           |  | Indoor fan motor fault  |
| Malfunction No. | Content of diagnosis   | Action  |
| 1               | Check the indoor cross-flow fan blade  | If the fan does not run, readjust the fan position until it can run smoothly. |
| 2               | If the motor insert (CN3, CN4) on indoor main PCB is in good contact with the slot | Insert again if loose.  |
| 3               | Startup capacitance value  | Capacitance incorrect. Replace with a new capacitor.                          |
| 4               | The above inspections are normal   | Replace the indoor main PCB   |

**3. Display E3, E7, E8**

|                 |   |   |
|-----------------|---|---|
| Problem symptom |   | Display E3, E7, E8  |
| Cause           |   | Outdoor exchange temperature thermistor and outdoor air temperature thermistor and discharge temperature sensor fault |
| Malfunction No. | Content of diagnosis  | Action  |
| 1               | If the temperature sensor on outdoor power source board is in good contact with the slot (CN1, CN2)   | Insert again if loose.  |
| 2               | Measure the resistance on the two ends of outdoor temperature thermistor:<br><br>Resistance of CN1 terminal thermistor ( $25^{\circ}\text{C} / 5\text{k}\Omega$ ). For other resistance, please refer to the temperature – Resistance Sheet. Resistance of CN2 terminal thermistor( $25^{\circ}\text{C} / 20\text{k}\Omega$ ). For other resistance, please refer to the discharge temperature thermistor resistance sheet. | Replace the temperature sensor if the resistance is incurred to drift, open or short circuiting.                      |
| 3               | If the above testing is normal  | Outdoor power source board  |

**4. Display EA**

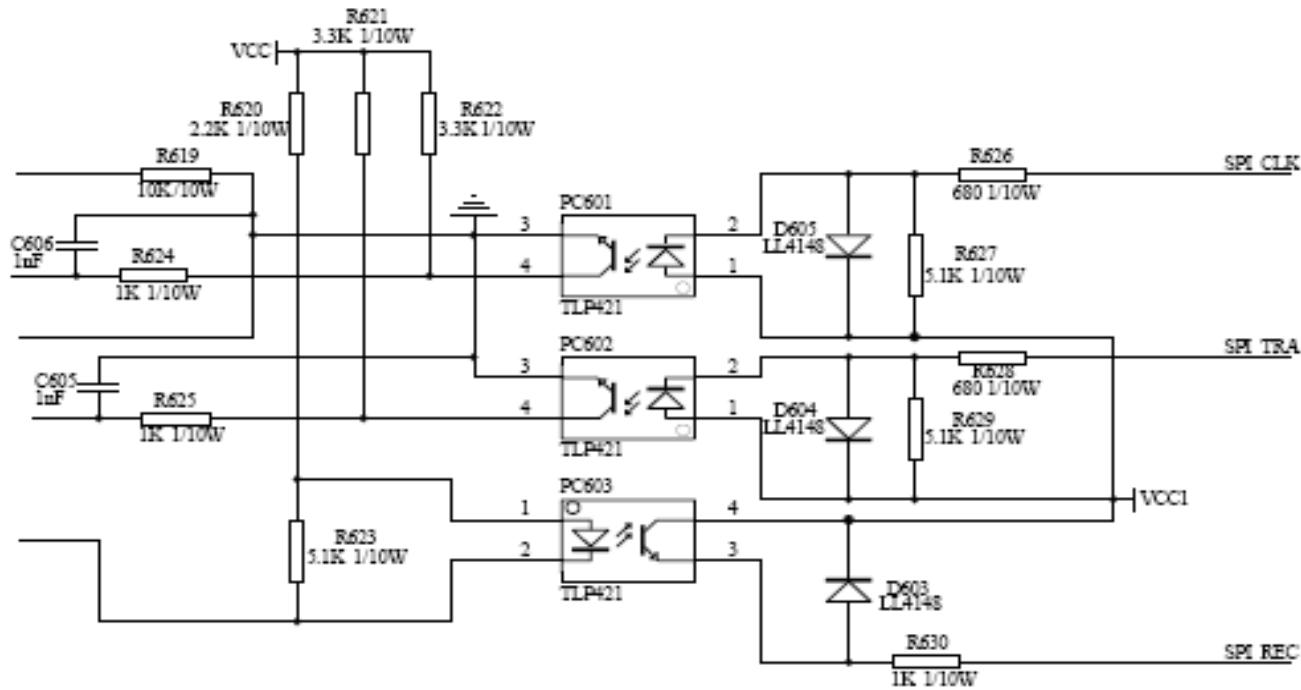
|                 |                               |   |
|-----------------|-------------------------------|---|
| Problem symptom |                               | Display EA  |
| Cause           |                               | Current sensor fault                                |
| Malfunction No. | Content of diagnosis          | Action  |
| 1               | Check for refrigerant leakage | Find the leakage point and recharge the refrigerant |
|                 |                               | Replace the outdoor power source board              |

**5. Display EC**

| Problem symptom |   | Display EC   |
|-----------------|---|--|
| Cause           |   | Outdoor communication fault between power source board and intelligent power module                          |
| Malfunction No. | Content of diagnosis  | Action   |
| 1               | Check the contact of communication wire (CN5) between power source board and intelligent power module                 | Insert again if loose.   |
| 2               | After the complete unit is energized, check the indicators on outdoor power source board and intelligent power module | Replace the intelligent power module<br>If the fault remains unsolved, replace the power source board again. |
|                 |   | Replace the power source board<br>If the fault remains unsolved, replace the intelligent power module again. |

You can check each voltage of the electrical board communication pin, the normal data is as the following:

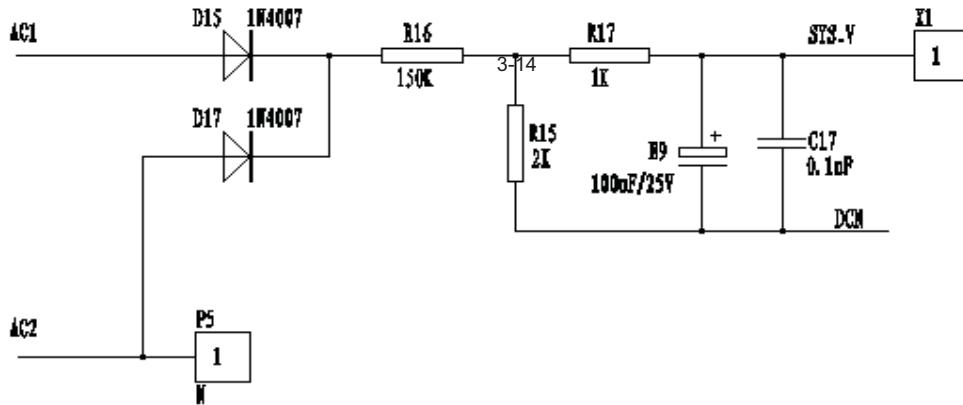
| Pin        | 1 | 2       | 3       | 4   | 5        | 6  |
|------------|---|---------|---------|-----|----------|----|
| Voltage(V) | 5 | 1.0-4.8 | 1.8-4.1 | 2.6 | earthing | 15 |



Outdoor communication circuit

**6. Display EU**

| Problem symptom |  | Display EU                             |
|-----------------|--|--|
| Cause           |  | Voltage sensor fault                   |
| Malfunction No. | Content of diagnosis   | Action                                 |
| 1               | The outdoor power source board can't check the voltage, check the voltage lower or higher than the protector voltage . | Insert again if loose.                 |
|                 |  | Replace the outdoor power source board |

**7. Display EP**

| Problem symptom |  | Display EP  |
|-----------------|--|---|
| Cause           |  | Temperature switch fault ( on top of the compressor)  |
| Malfunction No. | Content of diagnosis   | Action  |
| 1               | Check the insert position CN3 of the compressor top temperature switch wires on outdoor power source board | Insert again if loose.  |
|                 | No switch on compressor top  | Jumper short-circuiting (This function not provided for 1 – 1.5P unit)  |
| 2               | Compressor temperature. The temperature is very high, accompanied with bad smell.                          | Check the U, V and W wires of the compressor. The correct sequence of U, V and W wiring shall be "red, white and blue". Connect again if incorrect.   |
|                 |  | Check the system pressure. The pressure is low. Add refrigerant to ensure the system pressure is normal.  |
|                 |  | Check the outdoor ventilation and if there is any obstruction that affects the normal radiating of the air conditioner. Install to the position as required in the Installation Manual and ensure the air inlet and outlet of the outdoor unit is smooth. |
| 3               | Compressor temperature: The temperature is not high. Short circuit CN3.                                    | If the fault is solved after short circuiting, replace the shell temperature switch.  |
|                 |  | If the fault remains unsolved after replacing the shell temperature switch, please replace the outdoor power source board.  |

**8. Display P1**

| Problem symptom |   | Display P1                                       |
|-----------------|---|--|
| Cause           |   | Oversupply / undervoltage protection             |
| Malfunction No. | Content of diagnosis  | Action   |
| 1               | Test the supply voltage if it is between 160V ~260V (AC) .                              | It is normal protection if exceeding this range. |
| 2               | Test if the voltage between L and N terminal of outdoor unit is within 160V~260V (AC) . | It is normal protection if exceeding this range. |
| 3               | If the voltage is normal:   | Replace the outdoor power source board           |

**9. Display E9 (Firstly display P0 or P9, then change to E9)**

| Problem symptom |  |   | Display E9 (Firstly display P0 or P9, then change to E9)  |
|-----------------|--|---|---|
| Cause           |  |   | Intelligent power module of drive and module fault  |
| Malfunction No. | Content of diagnosis   |   | Action  |
| 1               | Re-energize and check the protection code on display. Firstly display P0 | If this code is displayed when the compressor is started for several seconds or even not started, check the compressor connection for correctness | If no insert wrong, replace the intelligent power module  |
|                 |  | "P0" appears when the air conditioner is working  | Fix the screws again if loose.  |
|                 |  | Check the system pressure.  | Recharge refrigerant if the pressure is low. Discharge some refrigerant if the pressure is too high.                              |
|                 |  | Check the outdoor ventilation and if there is any obstruction that affects the normal radiating of the air conditioner.                           | Install to the position as required in the Installation manual and ensure the air inlet and outlet of the outdoor unit is smooth. |
|                 |  | The above inspections are normal, but the fault remains unsolved  | Replace the intelligent power module  |
| 2               | Re-energize and check the protection code on display. Firstly display P9 | If this code is displayed when the compressor is started for several seconds or even not started, check the compressor connection for correctness | If no insert wrong, replace the intelligent power module  |
|                 |  | When the compressor is restarted immediately after stop, this might also cause P9 protection because the cooling system is not stable.            | Try starting the air conditioner again after a longer period of stop  |
|                 |  | P9 appears after the air conditioner is started and has run for a period of time  | Replace the intelligent power module  |
|                 |  | Cooling / heating is normal during run  | Insert again if loose.  |

**10. Display EE**

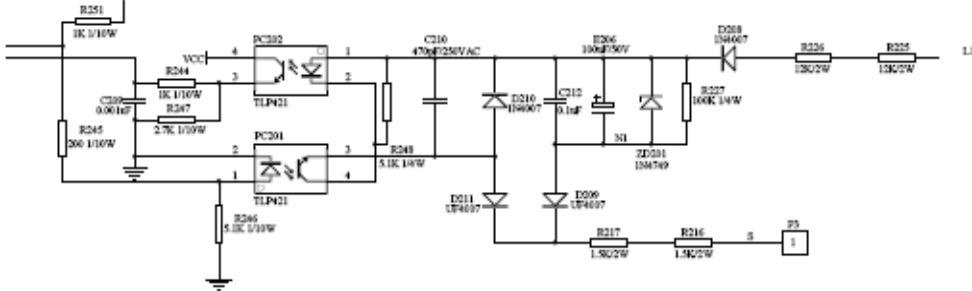
| Problem symptom |   |  | Display EE                         |
|-----------------|---|--|------------------------------------|
| Cause           |   |  | EEPROM fault                       |
| Malfunction No. | Content of diagnosis                                      |  | Action                             |
| 1               | Shut off the power and supply again, if EE display again: |  | Replace outdoor power source board |

**11. Display P1**

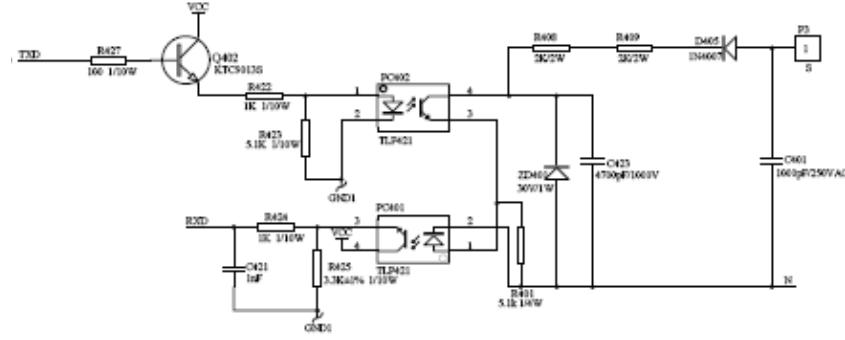
| Problem symptom |   |  | Display P1                                       |
|-----------------|---|--|--|
| Cause           |   |  | Overvoltage / undervoltage protection            |
| Malfunction No. | Content of diagnosis  |  | Action   |
| 1               | Test the supply voltage if it is between 160V ~260V (AC) .                              |  | It is normal protection if exceeding this range. |
| 2               | Test if the voltage between L and N terminal of outdoor unit is within 160V~260V (AC) . |  | It is normal protection if exceeding this range. |
| 3               | If the voltage is normal  |  | Replace the outdoor power source board           |

**12. Display E0、E5**

| Problem symptom   |  |   | Display E0、E5  |
|---|--|---|--|
| Cause   |  |   | Indoor / outdoor communication fault   |
| Malfunction No.   | Content of diagnosis   |   | Action   |
| 1<br>Energize and observe for approx. 10 minutes. If E0 is still displayed or changed to E5 after a period of time: | Energize and observe for approx. 10 minutes. If E0 is still displayed or changed to E5 after a period of time: | 1. Check if the indoor and outdoor connections are correct. The terminal L and N shall correspond to each other on indoor and outdoor units. Measure the voltage on outdoor terminal L and N (before display of E0 fault). If the voltage is "0":<br><br>2. If the L & N voltage is normal, measure the voltage between the outdoor terminal N and 1. If the voltage change occurs between 0~24V (change pulse voltage) | Replace the indoor main PCB.   |
|   |  | 3. If the L & N voltage is normal, measure the voltage between the outdoor terminal N and 1. If the voltage change occurs between 0~12V change pulse voltage), but there is no 24V:<br><br>4. If the L & N voltage is normal, measure the voltage between the outdoor terminal N and 1. If the voltage has no change:   | Replace the outdoor power source board.<br><br>Firstly replace the indoor main PCB. If the fault remains unsolved, replace the outdoor power source board.   |
|   | Indicator on outdoor power source board  | 5. Indicator on outdoor power source board<br>1) The indicator is dark: Check IPM board – Test the pins of rectifier bridge, fast recovery diode (FRD) and IGBT elements for any breakdown, short circuiting or damage.<br><br>2) If no damage, test the DC voltage between DC+ and DC-. If the voltage is approx. 310V:<br><br>3) If no damage, test the DC voltage between DC+ and DC-. If the voltage is zero:       | Replace the power source board.  |
|   |  | 6. If the problem cannot be solved by using the methods above:  | Replace the power source board.  |
|   |  | 7. If this fault appears at the initial installation and testing of the complete unit   | Firstly replace the intelligent power module . If the problem remains unsolved, replace the indoor main PCB. Power source board . power factor correction.<br><br>please check if the indoor control board and outdoor inverter module are of the same generation. |



The schematic diagram of Indoor unit communication loop



The schematic diagram of the partial outdoor unit communication loop

**13. Display P4**

| Problem symptom |   | Display P4   |
|-----------------|---|--|
| Cause           |   | Discharge overtemperature protection   |
| Malfunction No. | Content of diagnosis  | Action   |
| 1               | Check if the air inlet and outlet of outdoor unit is blocked by any obstructions.   | Install to the position as required in the Instruction Manual and ensure the air inlet and outlet of the outdoor unit is smooth. |
| 2               | Check the system for shortage of refrigerant.   | Add refrigerant  |
| 3               | Check if the exhaust temperature sensor is drifted, short circuited or open circuited. (25°C/20kΩ). For other resistances, please refer to the Exhaust Temperature Sensor – Resistance Sheet) | Replace the exhaust temperature sensor   |
| 4               | Control board damaged   | Replace the outdoor power source board   |

**14. Display P2**

| Problem symptom |  | Display P2   |
|-----------------|--|--|
| Cause           |  | Overcurrent protection   |
| Malfunction No. | Content of diagnosis   | Action   |
| 1               | Check if the outdoor fan motor is stopped due to overheat protection, or damaged, and if the fan capacitor is damaged. | Replace the fan capacitor, replace the outdoor power source board and the damaged outdoor fan motor. |

**15. Display P5**

| Problem symptom |   | Display P5  |
|-----------------|---|---|
| Cause           |   | Subcooling protection under cooling mode  |
| Malfunction No. | Content of diagnosis  | Action  |
| 1               | Check if the air inlet and outlet of indoor unit is blocked by any obstructions.  | Install to the position as required in the Installation manual and ensure the air inlet and outlet of the outdoor unit is smooth. |
| 2               | Check the system for shortage of refrigerant.   | Add refrigerant   |
| 3               | Check if the exhaust temperature sensor is drifted, short circuited or open circuited. (Measure the resistance of the resistors on two ends of indoor temperature sensor: (25°C / 5kΩ). For other resistances, please refer to the Temperature – Resistance Sheet.) | Replace room temperature sensor (IRT) and Indoor pipe (coil) temperature sensor (IPT)   |
| 4               | Control board damaged   | Replace the indoor control board  |

**16. Display P6**

| Problem symptom |   | Display P6  |
|-----------------|---|---|
| Cause           |   | Overheating protection under cooling mode   |
| Malfunction No. | Content of diagnosis  | Action  |
| 1               | Check if the air inlet and outlet of outdoor unit is blocked by any obstructions.   | Install to the position as required in the Installation manual and ensure the air inlet and outlet of the outdoor unit is smooth. |
| 2               | Check the system for shortage of refrigerant.   | Add refrigerant   |
| 3               | Check if the outdoor evaporator coil temperature sensor is drifted, short circuited or open circuited (25°C/5KΩ). For other resistance, please refer to the Temperature – Resistance Sheet. | Replace the outdoor coil temperature sensor   |
| 4               | Control board damaged   | Replace the outdoor power source board  |

**17. Display P7**

| Problem symptom |  | Display P7  |
|-----------------|--|---|
| Cause           |  | Overheating protection under heating mode   |
| Malfunction No. | Content of diagnosis   | Action  |
| 1               | Check if the air inlet and outlet of outdoor unit is blocked by any obstructions.  | Install to the position as required in the Installation manual and ensure the air inlet and outlet of the outdoor unit is smooth. |
| 2               | Check the system for shortage of refrigerant.  | Add refrigerant   |
| 3               | Check if the indoor exchange temperature thermistor is drifted, short circuited or open circuited. (Measure the resistance of the resistors on two ends of indoor temperature thermistor: (25°C / 5kΩ). For other resistances, please refer to the Temperature – Resistance Sheet. | Replace the Indoor exchange temperature thermistor(IPT)   |
| 4               | Control board damaged  | Replace the indoor control board  |

**18. Display P8**

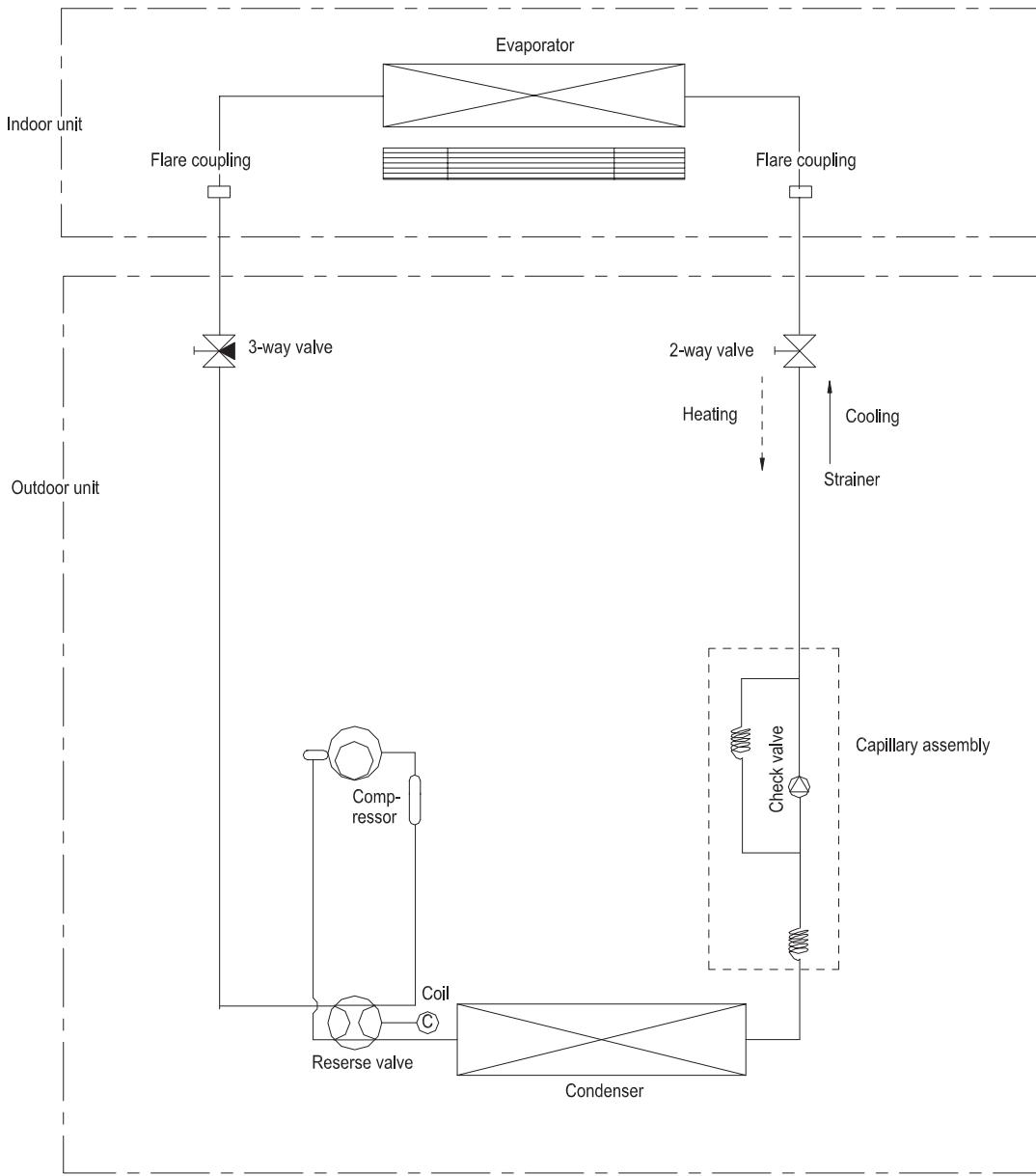
| Problem symptom |  | Display P8  |
|-----------------|--|---|
| Cause           |  | Outdoor air temperature over/under protection                                       |
| Malfunction No. | Content of diagnosis   | Action  |
| 1               | The compressor cannot run under cooling mode when the outdoor temperature is lower than -1°C, or run under heating mode when the outdoor temperature is higher than 33°C, whilst the compressor alarms P8 protection.  | Normal protection function  |
| 2               | If the temperature is not within the protective range above, please refer to the Temperature – Resistance Sheet (See Appendix). Use the multimeter to measure the resistors on the two ends of outdoor intake temperature sensor (CN1) (25°C/5kΩ). For other resistance, please refer to the Temperature – Resistance Sheet. | Replace the sensor if it is incurred to drift, open circuiting or short circuiting. |
| 3               | If the fault remains unsolved after replacement of the sensor  | Replace the outdoor power source board  |

**19. Display P9**

| Problem symptom |  | Display E9 (Firstly display P0 or P9, then change to E9)   |
|-----------------|--|--|
| Cause           |  | Intelligent power module of drive and module fault   |
| Malfunction No. | Content of diagnosis   | Action   |
| 1               | Re-energize and check the protection code on display. Firstly display P9 | If this code is displayed when the compressor is started for several seconds or even not started, check the compressor connection for correctness. |
|                 |  | P9 appears after the air conditioner is started and has run for a period of time   |
|                 |  | Cooling/heating is normal during run   |
|                 |  | If the cooling / heating are abnormal, check the compressor wiring for correctness.  |
|                 |  | When the compressor is restarted immediately after stop, this might also cause P9 protection because the cooling system is not stable.             |
|                 |  | Try starting the air conditioner again after a longer period of stop   |

## CHAPTER 4. REFRIGERATION CYCLE

### [1] SCHEMATIC DIAGRAM



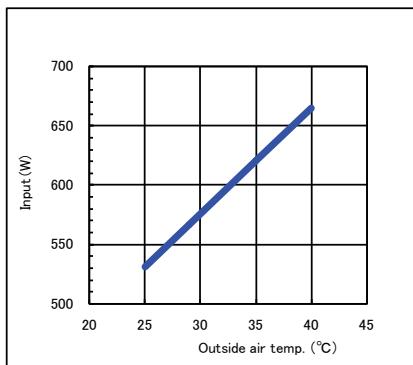
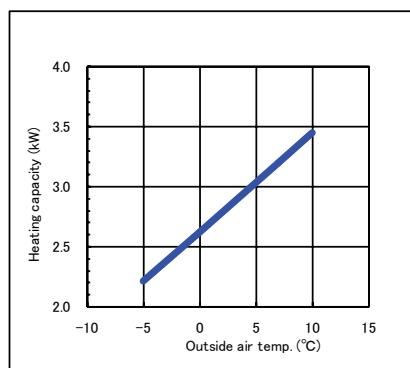
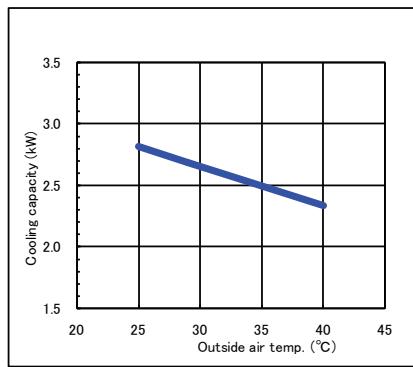
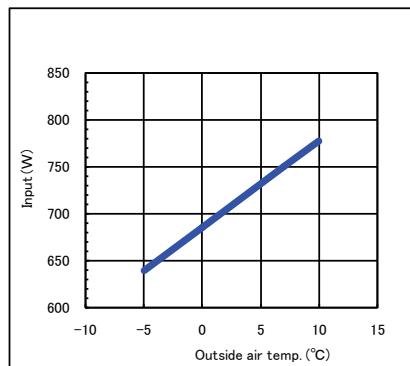
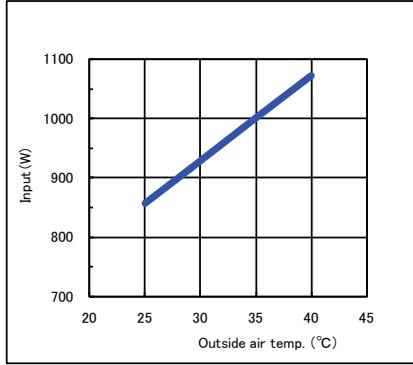
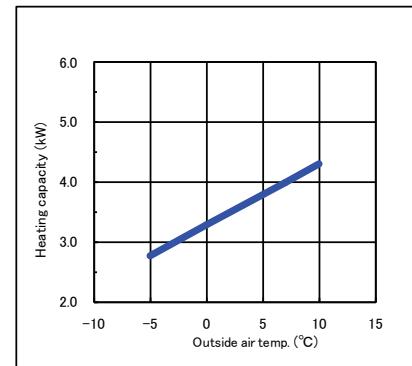
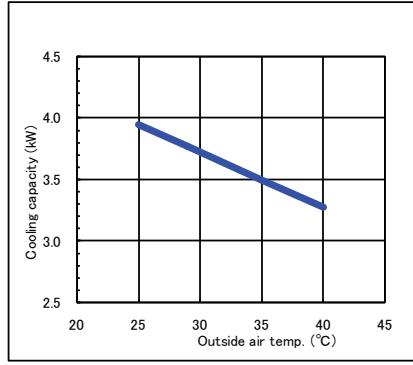
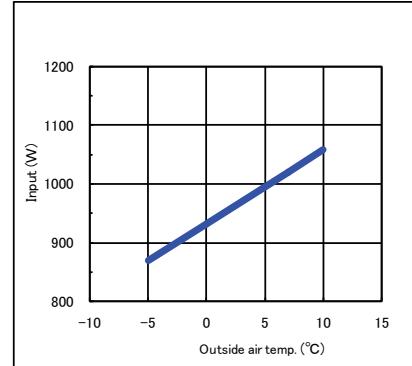
### [2] STANDARD CONDITION

|         | Indoor side         |                       | Outdoor side        |                       |
|---------|---------------------|-----------------------|---------------------|-----------------------|
|         | Dry-bulb Temp. (°C) | Relative Humidity (%) | Dry-bulb Temp. (°C) | Relative Humidity (%) |
| Cooling | 27                  | 47                    | 35                  | 40                    |
| Heating | 20                  | —                     | 7                   | 87                    |

### [3] TEMPERATURE AT EACH PART AND PRESSURE IN 3-WAY VALVE

#### NOTE

- 1) Indoor fan speed: Hi
- 2) Vertical adjustment louver "front", Horizontal adjustment louver "level"
- 3) Indoor air temp. : Cooling 27°C, Heating 20°C
- 4) Power source : 230V, 50Hz
- 5) Compressor speed : Rated frequency

**AY-XP9PSR/AE-XP9PSR****1.1. At Cooling****1.2. At Heating****AY-X12PSR/AE-X12PSR****1.1. At Cooling****1.2. At Heating**

## CHAPTER 5. DISASSEMBLY PROCEDURE

If, in carrying out repairs and modifications, the work requires the use of arc- and flame-producing apparatus, such as welding, brazing and soldering equipment, this work shall only be started after the rooms have been thoroughly ventilated. While the work is being carried out, the mechanical ventilation, if any, shall be kept in constant operation and all windows and doors kept open. In the case of repairs to parts of the refrigerant circuit, it may be necessary that not only the workman but also a second person shall be present for observation and assistance. Necessary protective equipment shall be available and, in the case of open flames or arcs, fire extinguishing apparatus shall be ready to hand. Welding and brazing shall be carried out by qualified workmen.

### [1] INDOOR UNIT

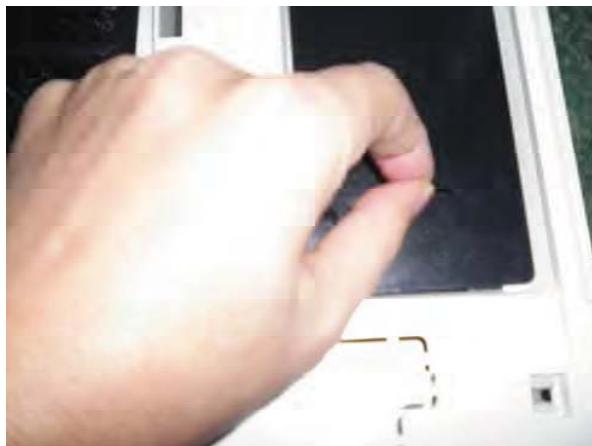
1) Open the open panel and remove it.



2) Remove a screw fixing the cord holder.



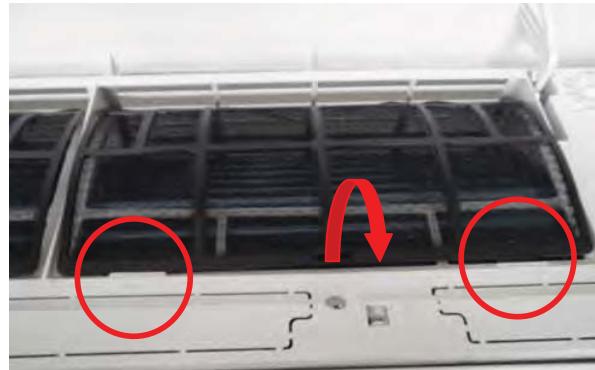
3) Remove the cord holder.



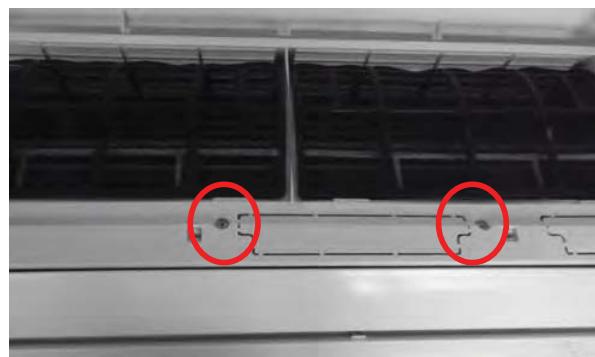
4) Loosen the screws on the terminal board and remove the unit-to-unit wiring connected with the board.

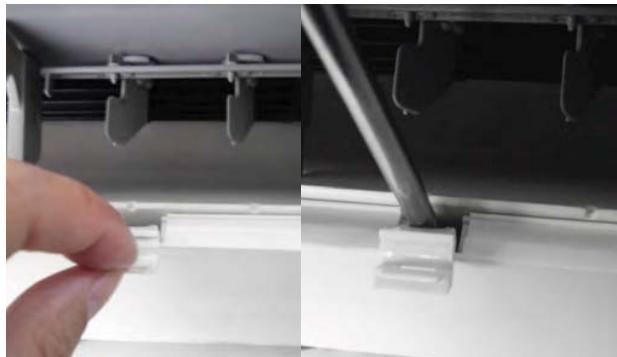


5) Slide out the 2 air filters.

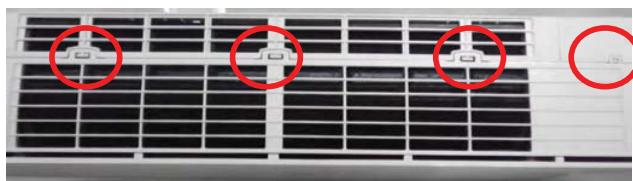


6) Remove 5 screws fixing the front panel.





7) Unfasten the front panel and pull forward it slightly. (4 circled spots in the picture are hooked.)



Open the horizontal louver.

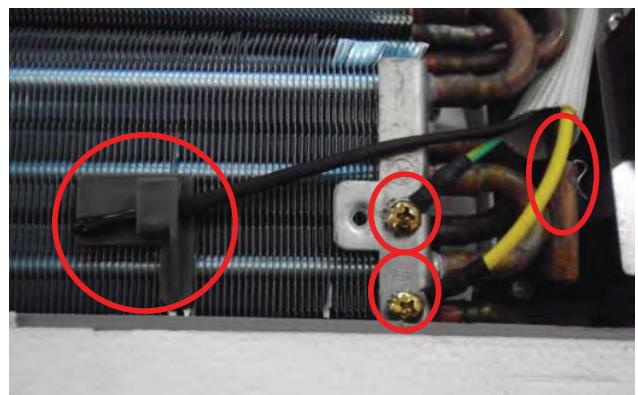


Horizontal Louver

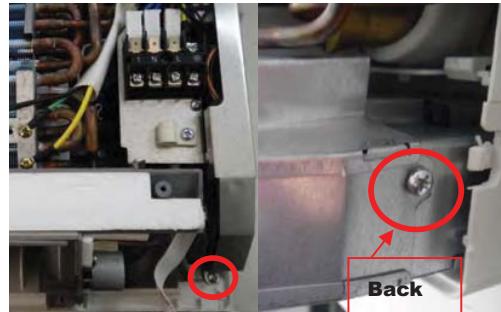
Pull the front panel toward in the direction shown the picture.



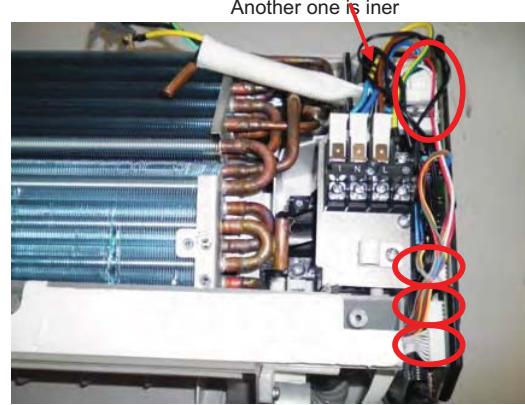
8) Remove the thermistor supportor and the thermistor clip. Remove a screw fixing the earth wire.

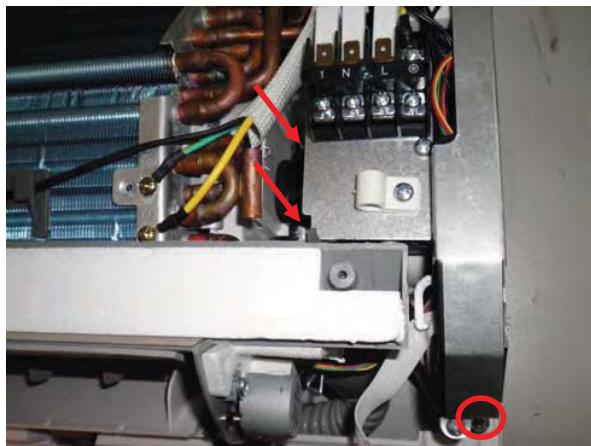


9) Remove the screw fixing on the control box cover from the control box and pull it away.



10) Remove the 3 screw and the 5 connectors and remove the control box.

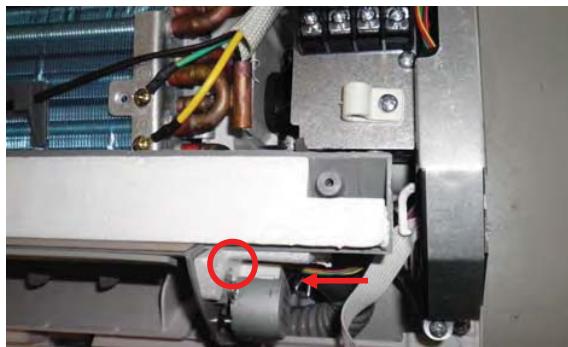




11) Remove the horizontal louver from cabinet while warping.



12) Remove the two screw and remove the vane motor.

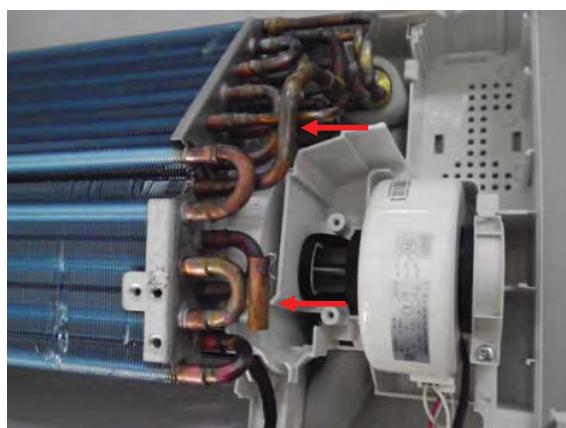


13) Remove the water drainage assembly and take off .



14)

a) Remove the 4 screws fixing the side left and side right.

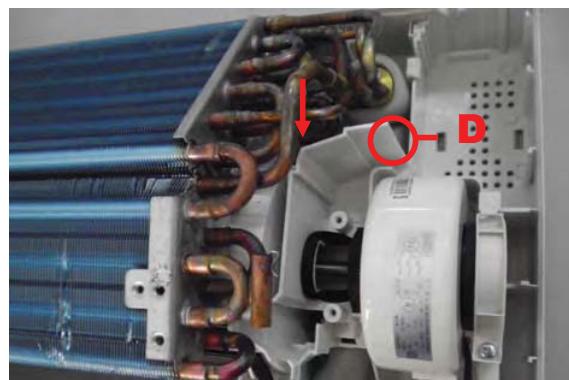
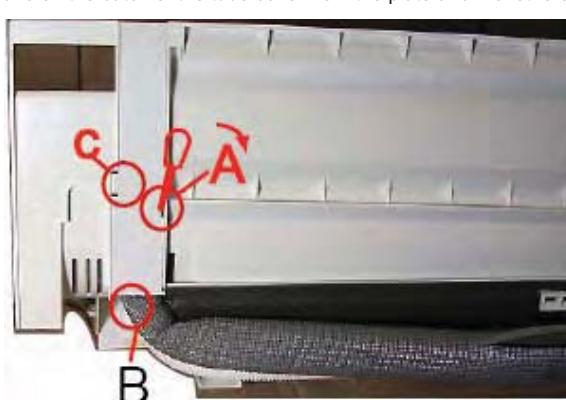


b) Remove the tube cover.

•Insert the (-) screwdriver to A hole, D clip and then lean it to the right as lifting B part.

c) Remove the evaporator from the cabinet.

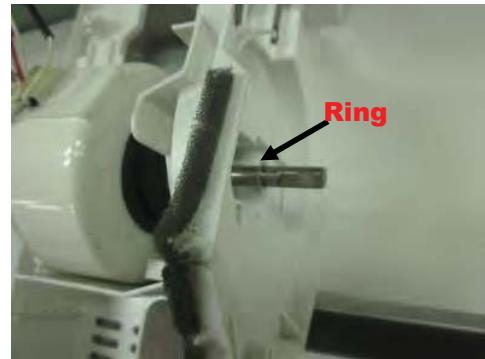
•Take off the catch of the tube cover from the plate and move the evapo



15) Loosen the screw of cross flow fan and separate the cross flow fan and the fan motor



When assembling them, insert the motor shaft in the boss of the cross flow fan to the ring position.



## [2] OUTDOOR UNIT

1)The fixed screw of control box cover is removed and control boxcover is removed.



3) The 2 screws on the left-hand side of top plate ass'y is removed.



2)The 2 screws on the right-hand side of top plate ass'y is removed.



4)The screw on the left-hand side of grille is removed

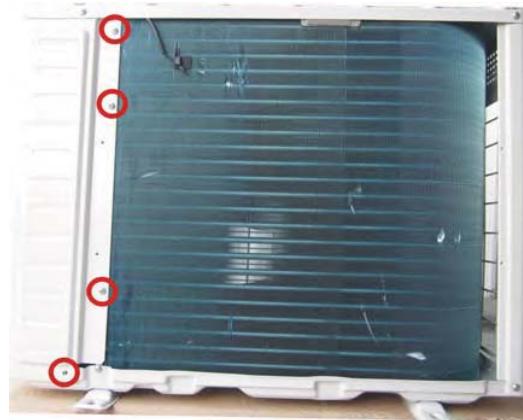


5)The screw on the right-hand side of front panel is removed

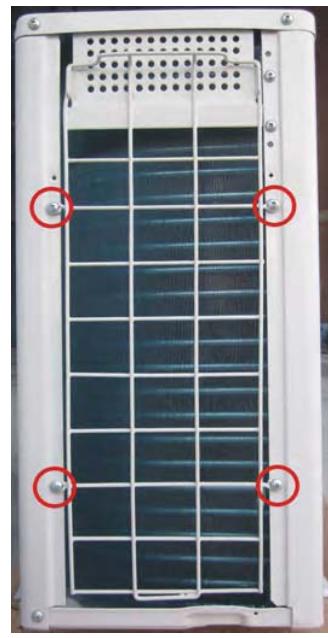


9) Unscrew the 4 screws on the back side of right plate and removed the right plate.

6)The screw on the left-hand side of front panel is removed

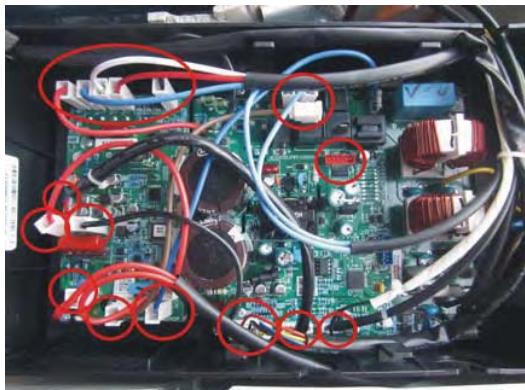


10) Unscrew the 4 screws on the side left grille and removed the left grille.

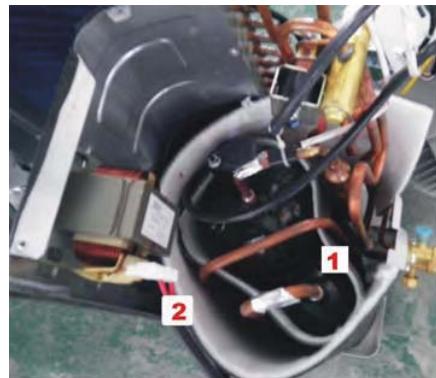


8)The 5 screws on the right-hand side of right plate is removed.

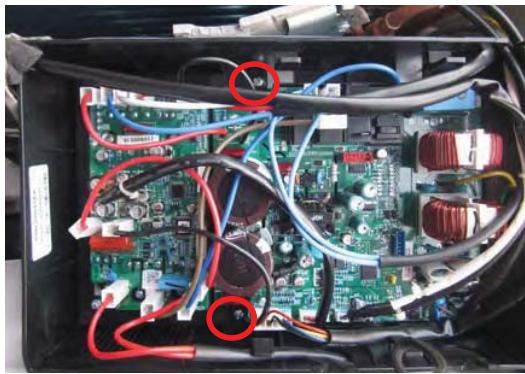
11) Remove the connectors and reactor in the control box.



14) Remove the compressor covers 1 and 2.



12) Remove the 2 screws fixed the control box.



16) Remove the lead wire and the cover gasket.



13) Remove the 3 screws fixed the bulkhead plate.



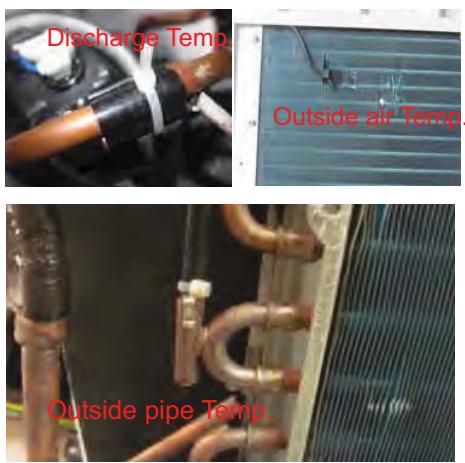
17) Remove the compressor cover.



18) Remove the 3 thermistors.



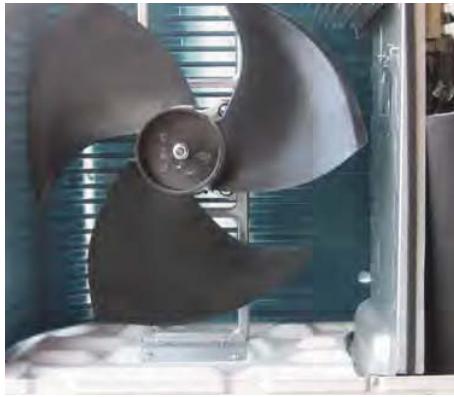
19) Thermistor position.



20) Remove the outdoor fan.



19) Unscrew the 2 screws and remove the motor angle.



### [3] CONTROL BOX

1) Control unit box's Approach to decomposition.

- 1) Take off lead wires from terminal assembly.  
(Blue wire,Brown wire,Black wire)



2) Take off screw (earth).

Take off earth lead wire(green/yellow) from electronic box.



3) Take off box cover.



4) Take off screws 6 PCS



# CHAPTER7. INSTALLATION MANUL

**SHARP**

**SPLIT TYPE ROOM AIR CONDITIONER  
INSTALLATION MANUAL**

**INDOOR UNIT/OUTDOOR UNIT**  
AY-X9PSR/AE-X9PSR, AY-X12PSR/AE-X12PSR

## SAFETY PRECAUTIONS

- Installation must be made in accordance with the installation manual by qualified service personnel. Incorrect work will cause electric shock, water leak, fire.
- Be sure to use the attached accessories parts and specified parts for installation. Use of other parts will cause electric shock, water leak, fire, the unit falling.
- The appliance shall be installed in accordance with national wiring regulations. Wrong connection can cause overheating or fire.
- After installation has complete, check that there is no leakage of refrigerant gas. If the refrigerant gas contact with fire, it may generate toxic gas.
- Ventilate the room if refrigerant gas leaks during installation. If the refrigerant gas contact with fire, it may generate toxic gas.
- Use the specified electrical cable. Make sure the cable is secured in place and that the terminals are free of any excess force from the cable. Otherwise overheating or fire may result.
- Form the cable so that the control box cover, the cord holder and cable holder are not loose. Otherwise overheating, fire or electric shock may result.
- Tighten the flare nut with a torque wrench according to the specified method. If the flare nut is tightened too hard, the flare nut may be broken after a long time and cause refrigerant gas leakage.
- When installing the unit, take care not to enter air substance other than the specified refrigerant(R410A) in the refrigerant cycle. Otherwise, it will cause burst and injury as a result of abnormal high pressure in the refrigerant cycle.
- Be sure to connect the refrigerant pipe before running the compressor. Otherwise, it will cause burst and injury as a result of abnormal high pressure in the refrigerant cycle.
- Earth the unit. Incomplete earth may cause electrical shock.
- Install an earth leakage breaker to avoid electric shock in case of leak. Use the current-activated, high-sensitivity, high-speed type breaker with a rated sensitivity current of below 30 mA and an operating time of below 0.1 second.
- Arrange the drain hose to ensure smooth drainage. Insufficient drainage may cause wetting of the room, furniture etc.
- This room air conditioner uses refrigerant R410A. Use the pipe, flare nut and tools exclusively for R410A.

## ACCESSORIES

| ITEMS            | Q'ty | APPLICATION                                     | ITEMS         | Q'ty | APPLICATION                           | ITEMS                    | Q'ty | APPLICATION                |
|------------------|------|---|---------------|------|---------------------------------------|--------------------------|------|----------------------------|
| 1.MOUNTING PLATE | 1    | To mount the indoor unit on the wall.           | 5.DRY BATTERY | 2    | For the remote control AAA batteries. | 9.PUTTY                  | 1    | Sealing wall-through hole. |
| 2.WALL PLUG      | 6    | To fix the mounting plate with the long screws. | 6.MANUALS     | 1    | Installation manual                   | 10.INSULATION CASING     | 1    |                            |
| 3.LONG SCREW     | 6    | To fix the mounting plate with the wall plugs.  | 7.VINYL TAPE  | 1    | Wire & pipe finishing                 | 11.DRAIN PIPE CONNECTION | 1    |                            |
| 4.REMOTE CONTROL | 1    | To control remotely.                            | 8.DRAIN HOSE  | 1    | Drainage                              |                          |      |                            |

## NOTES ON LOCATIONS

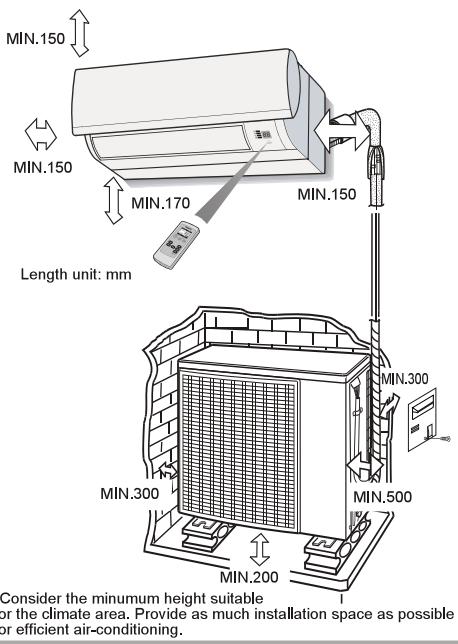
### Indoor unit

1. Keep the air outlet clear of any obstacle so that outgoing air flows smoothly in the entire room.
2. Make a drain hose hole for easy drainage.
3. Provide sufficient space on both sides and above the unit.
4. The air filters should be easily taken in and out.
5. Keep TV set, radio and the like 1 m or more away from the unit and the remote control.
6. Keep the air inlet clear of obstacles that could block incoming air.
7. The remote control may not function properly in a room equipped with an electronic simultaneous-start or rapid-start fluorescent lighting.
8. Select a location that does not cause loud operation noise and extreme vibrations.

### Outdoor unit

1. Place the outdoor unit on a stable base.
2. Provided sufficient space around the unit. It should also be well ventilated.
3. The unit should not be exposed to strong wind nor splashed with rain water.
4. Water drain from the unit should be let out without problem. Lay a drain hose if required. In cold regions, installation of the drain pipe is not advisable as freezing could result.
5. Keep TV set, radio and the like 1 m or more away from the unit.
6. Avoid locations exposed to machine oil vapor, salty air (facing the seashore, for example), hot spring vapor sulfur gas, etc. Such location can cause breakdown.
7. Avoid locations exposed to muddy water (along a road, for example) or where the unit can be tampered with.
8. Select a location where the outgoing air or operating noise cannot annoy others.
9. Keep the air outlet opening free of any obstacle. This could affect the performance of the unit and create loud noises.

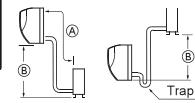
## INSTALLATION DIAGRAM



## PIPING

| Max. piping length:A | Max. height difference:B | Min. piping length | Additional refrigerant (piping length exceeds 5m) |
|----------------------|--------------------------|--------------------|---|
| 15 m                 | 5 m                      | 1 m                | AE-X9PSR 20 g/m<br>AE-X12PSR 30 g/m               |
|                      |                          |                    |   |

- Standard piping length is 5m.
- When the outdoor unit is placed at a higher level than the indoor unit, provide a trap near the hose's lead-in port.

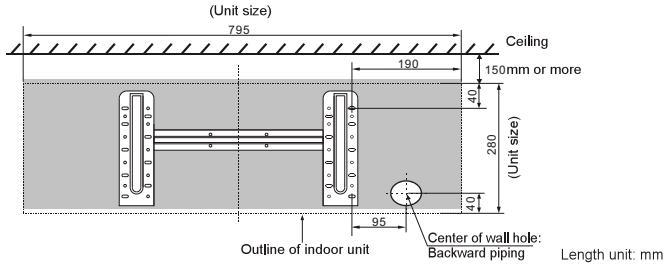


Use the refrigerant pipes shown in the table below.

| Pipe size                    | Pipe thickness   | Thermal insulation  |
|------------------------------|------------------|---|
| Liquid side                  | 1/4" (ø 6.35mm)  | 0.5 mm  |
| Gas side AY-X9PSR/AE-X9PSR   | 3/8" (ø 9.52 mm) | 0.6 mm  |
| Gas side AY-X12PSR/AE-X12PSR | 1/2" (ø 12 mm)   | Thickness: 6 mm or thicker<br>Material: Polyethylene foam |

• The thermal insulation should cover both the gas and liquid pipes.

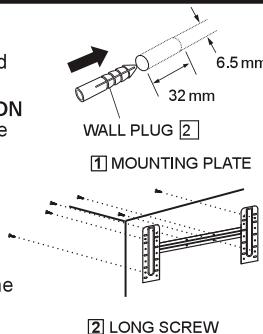
## INSTALLATION DIMENSION OF INDOOR UNIT



## 1 PLACING THE MOUNTING PLATE AND MAKING A PIPING HOLE

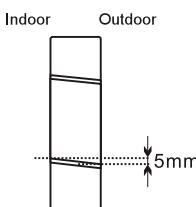
### Installing the mounting plate

- (1) Drill diameter 6.5mm, depth 32mm holes and fit the wall plug.
- (2) Referring to the "INSTALLATION DIMENSION OF INDOOR UNIT", mark the location for the fixing holes and the piping hole.
  - Recommended fixing holes are marked in circle around the hole. (6 points)
  - Make sure that the mounting plate is horizontally.
- (3) Secure the mounting plate to the wall with the long screws and check the stiffness.



### Making a piping hole

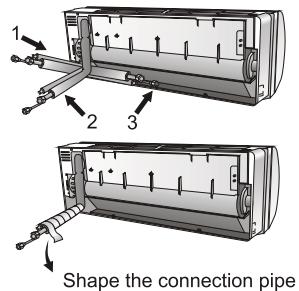
- (1) Drill a piping hole with 70mm diameter concrete drill or a hole saw with a 5mm downward slant to the outside.
- (2) Set the sleeve and caps.



## 2 SETTING UP THE INDOOR UNIT

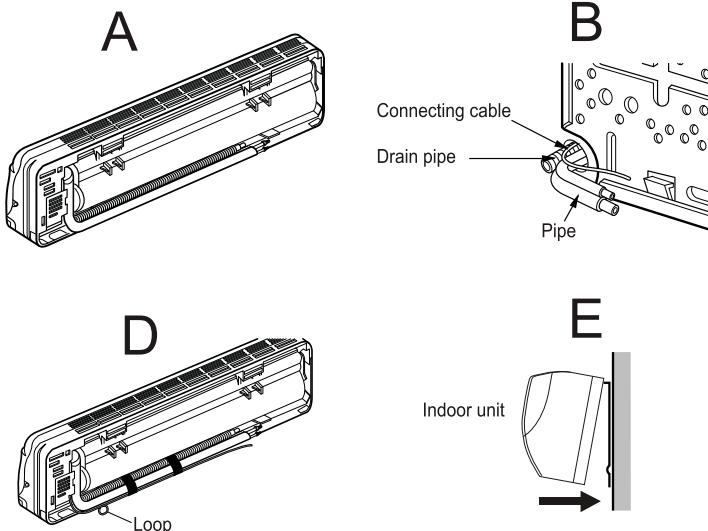
### Refrigerant piping connection

- (1) The piping can be run in the 3 directions indicated by numbers in the picture. When the piping is run in direction 1 or 3, cut a notch along the groove on the side of the indoor unit with a cutter.
- (2) Run the piping in the direction of the wall hole and bind the copper pipes, the drain pipe and the power cables together with the tape with the drain pipe at the bottom, so that water can flow freely.



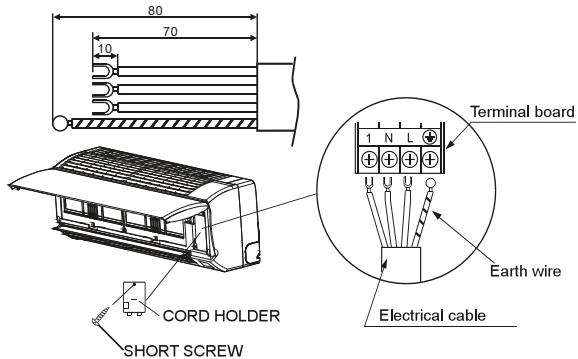
#### For left rear piping

- A. Route the indoor tubing with the drain hose to the required piping hole position.
- B. Insert the piping, drain hose and the connecting cable into the piping hole.
- C. Insert the connecting cable into the indoor unit.
- 1) Don't connect the cable to the indoor unit.
- 2) Make a small loop with the cable for easy connection later.
- D. Tape the tubing, drain hose and the connecting cable.
- E. Indoor unit installation  
Hang the indoor unit from the hooks at the top of the installation plate.



## 3 CONNECTING THE CABLE TO THE INDOOR UNIT

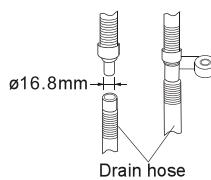
- (1) Process the end of the electrical cable for the indoor side.
  - Use a copper cable. (Cross-section area  $1.5\text{mm}^2$  or more)
  - Use a cable which is not lighter than polychloroprene sheathed flexible cord (design 245 IEC 57).
- (2) Open the open panel by about 50°.
- (3) Connect the electrical cable.
  - Be very careful not to confuse the terminal connections. Wrong cabling may damage the internal control circuit.
  - The markings on the indoor unit's terminal board must match with those of the outdoor unit.
- (4) Fix the cable with the accompanying cord holder and the short screw.
- (5) Close the open panel.



## 4 CONNECTING THE DRAIN HOSE

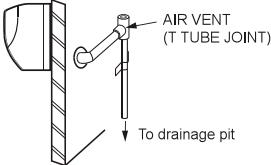
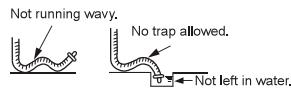
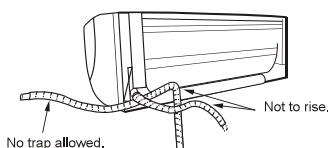
### Indoor unit

- (1) Connect a drain hose.
- (2) Tape over the connecting part.



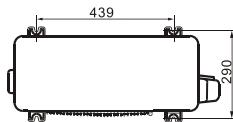
### Notes:

- Be sure to lay the drain hose downward for smooth drainflow.
- Be careful not to allow the drain hose to rise, form a trap or leave its end in water, as shown below.
- Coil thermal insulation around a drain hose extension, if running in the room.
- It is recommended to add an "intermediate air vent" when the drain hose is extended horizontally, or an "anti-back-flow air vent" when the hose is exposed to high winds on a high-rise building, for example. For this purpose, employ a "T tube joint" (PVC-made, commercially available) halfway in the hose.



## 5 OUTDOOR UNIT INSTALLATION

Referring to the figure, firmly fasten the outdoor unit with bolts.



Length unit: mm

## 6 CONNECTING THE REFRIGERANT PIPES

- Use pipes with thickness 0.8mm.
- Connect the pipes for the indoor unit first and then for the outdoor unit.
- Bend the pipes carefully as not to damage them.
- Do not over tighten the tubes; it may be deformed or damaged.  
Use a torque wrench, when possible. See the table below for the flare nut tightening torque.

### Flare nut tightening torque

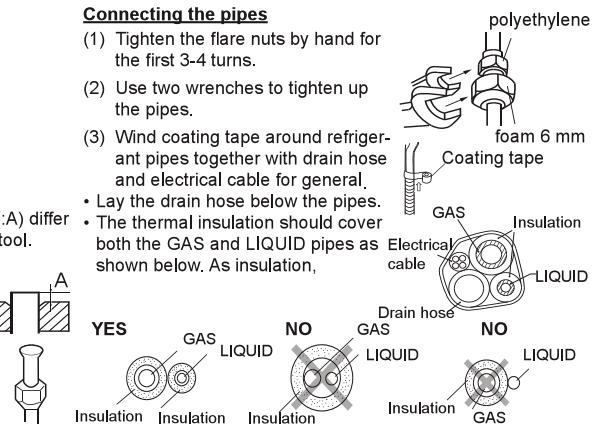
| Pipe size                       | Torque                        |
|---------------------------------|-------------------------------|
| Liquid side                     | 1/4" 16±2 N·m (1.6±0.2 kgf·m) |
| Gas side<br>AY-X9PSR/AE-X9PSR   | 3/8" 38±4 N·m (3.8±0.4 kgf·m) |
| Gas side<br>AY-X12PSR/AE-X12PSR | 1/2" 38±4 N·m (3.8±0.4 kgf·m) |

### Flaring the pipe end

- (1) Cutting with a pipe cutter  
Cut at a right angle.
- (2) Deburring  
Allow no cuttings in the pipe.
- (3) Putting in the flare nut
- (4) Flaring  
Flare processing dimensions(A) differ according to the type of flare tool.  
R410A tool: 0-0.5mm  
Conventional tool: 1.0-1.5mm
- (5) Checking  
To be flared perfectly circular.  
Flare nut not missing.

### Connecting the pipes

- (1) Tighten the flare nuts by hand for the first 3-4 turns.
- (2) Use two wrenches to tighten up the pipes.
- (3) Wind coating tape around refrigerant pipes together with drain hose and electrical cable for general.
- Lay the drain hose below the pipes.
- The thermal insulation should cover both the GAS and LIQUID pipes as shown below. As insulation,

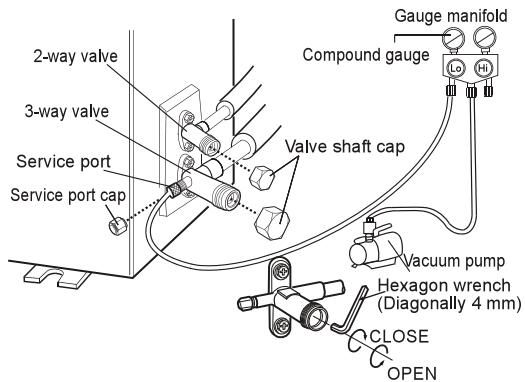


## 7 AIR REMOVAL

Use a vacuum pump, gauge manifold and hoses exclusively for R410A.

- (1) Remove both valve shaft caps of the 2 and 3-way valves.
- (2) Remove the service port cap of the 3-way valve.
- (3) Connect the gauge manifold hose to the service port and the vacuum pump.  
Be sure that the hose end to be connected to the service port has a valve core pusher.
- (4) Open the gauge manifold low-pressure valve(Lo) and operate the vacuum pump for 10-15 minutes.  
Make sure the compound gauge reads -0.1 MPa(-76 cmHg).
- (5) Close the gauge manifold valve.
- (6) Turn off the vacuum pump.  
Leave as it for 1-2 minutes and make sure the needle of the compound gauge does not go back.
- (7) Open the 2-way valve 90° counterclockwise by turning the hexagon wrench.  
Close it after 5 second, and check for gas leakage.\*
- (8) Disconnect the gauge manifold hose from the service port.
- (9) Fully open the 2-way valve with hexagon wrench.
- (10) Fully open the 3-way valve with hexagon wrench.
- (11) Firmly tighten the service port cap and both valve shaft caps with a torque wrench at the specified tightening torque.

\* Check the pipe connections for gas leak using a leakage detector or soapy water. Regarding leakage detector, use high-sensitivity type designed specially for R410A.



### Valve shaft cap tightening torque

| Pipe size                       | Torque                        |
|---------------------------------|-------------------------------|
| Liquid side                     | 1/4"                          |
| Gas side<br>AY-X9PSR/AE-X9PSR   | 3/8" 24±3 N·m (2.4±0.3 kgf·m) |
| Gas side<br>AY-X12PSR/AE-X12PSR | 1/2"                          |

### Service port cap tightening torque

| Torque                   |
|--------------------------|
| 11±1 N·m (1.1±0.1 kgf·m) |

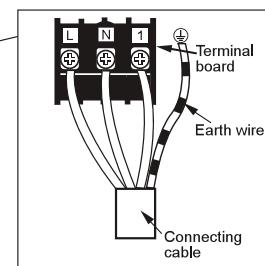
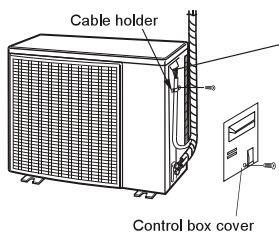
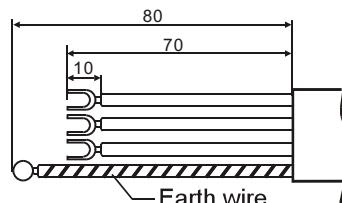
## 8 CONNECTING THE CABLE TO THE OUTDOOR UNIT

- (1) Process the end of the connecting cable for the outdoor unit.
  - Use a copper cable.
  - Use a cable which is not lighter than polychloropropene sheathed flexible cord (code designation 60245 IEC 57).
- (2) Remove the control box cover.
- (3) Remove the cable holder and connect the cables. Be sure that the terminal connections are as specified.
- (4) Fix the cable sheaths with the cable holder and the screw firmly.
- (5) Double-check that the cables are securely in place.
- (6) Place the control box cover back in the reverse order.

**Caution:**

- Be sure to put the cable leads deep into the terminal board and tighten up the screws. Poor contact can cause overheating or fire, or malfunction.

**Connecting cable**  
(Cross-section area: 1.5 mm<sup>2</sup>)



## 9 POWER CABLING

Prepare a dedicated power supply circuit.

|                 |                             |
|-----------------|-----------------------------|
| Supply power    | 220 V - 240 V, single-phase |
| Circuit breaker | 16 A                        |

- Fit a disconnect switch, having a contact separation of at least 3mm in all poles, to the electricity power line.

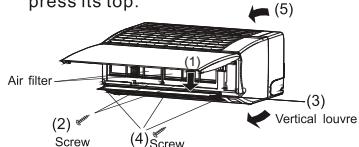
## 11 TEST RUN

- (1) Start operation with remote control or by pressing the "ON/OFF" button on the unit.
- (2) Turn the unit to COOLING mode at 27°C, then set fan speed to high.
- (3) Press the Full Power button 6 times rapidly and you will hear the unit ringing for 4 times. Now the unit is running in cooling test run mode.
- (4) Make sure the system runs well. Then stop the unit by pressing the "ON/OFF" button again or using remote control.



## DETACHING THE FRONT PANEL

- For servicing, for example, detach the front panel in the following steps. Be sure to disconnect the power cord from the wall outlet or turn off the circuit breaker.
- (1) Remove the air filter.
  - (2) Unscrew the 2 screws of the front panel.
  - (3) Adjust the vertical louvre to reveal the 3 screw covers.
  - (4) Pull out 3 screw covers with tweezers or other tool, then unscrew 3 screws hide inside.
  - (5) Extract 4 hooks along the upper surface for disassembly, then slightly open the upper part of front panel.
  - Caution: The display panel is connected with control box by a flat cable. It should also be detached in case that malfunction occurs.**
  - (6) To set the panel back into position, press-fit it at the bottom first and then press its top.

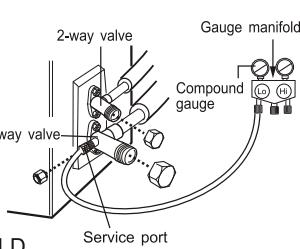


## PUMP DOWN

Pump down is adopted in the case of unit removal for re-installation, abandonment, repair etc. Pump down is to collect the refrigerant into the outdoor unit.

### PROCEDURE USING GAUGE MANIFOLD (Recommended procedure)

- (1) Connect the gauge manifold hose to the service port of the 3-way valve.
- (2) Run the air conditioner at cooling test run mode (Refer to 11 TEST RUN).
- (3) After 5-10 minutes, close the 2-way valve.
- (4) Close the 3-way valve when the compound gauge reading becomes almost 0 MPa(0 cmHg).
- (5) Stop the test run operation.
- (6) Disconnect the gauge manifold hose from the service port.
- (7) Disconnect both refrigerant pipes.



### PROCEDURE WITHOUT USING GAUGE MANIFOLD

- (1) Run the air conditioner at cooling test run mode (Refer to 11 TEST RUN).
- (2) After 5-10 minutes, fully close the 2-way valve by turning the hexagon wrench.
- (3) After 2-3 minutes, immediately close the 3-way valve fully.
- (4) Stop the test run operation.
- (5) Disconnect both refrigerant pipes.

**Caution:**

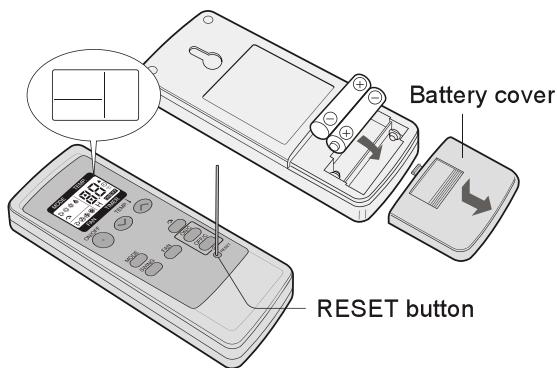
- Make sure that the compressor is turned off before removing the refrigerant pipes. Otherwise, it will cause burst and injury.
- Do not perform PUMP DOWN when refrigerant is leaking or there is no refrigerant in the refrigerant cycle. Otherwise, it will cause burst and injury.

## CHAPTER 6. OPERATION MANUAL

### USING THE REMOTE CONTROL

#### LOADING BATTERIES

- 1 Remove the battery cover.**
- 2 Insert two batteries.** (AAA(R03))  
Make sure the (+) and (-) polarities are correctly aligned.
- 3 Reinstall the battery cover.**
- 4 Press the RESET button using a thin stick.**



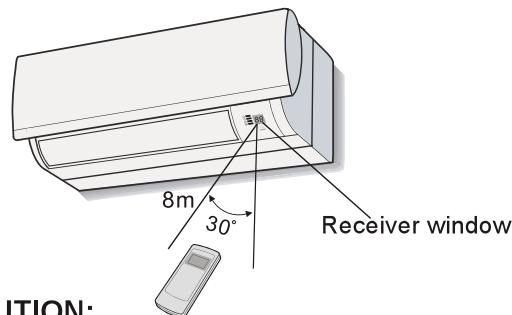
#### NOTE:

- The battery life is approximately 1 year in normal use.
- When replacing the batteries, always change both and use the same type.
- If you will not be using the unit for a long time, remove the batteries from the remote control.

#### HOW TO USE THE REMOTE CONTROL

Point the remote control towards the receiver window and press the desired button. The unit generates a beep when it receives the signal.

- Make sure nothing, such as curtains, block the signal receiver window.
- The signal effective distance is 8 m.



#### CAUTION:

- Do not expose the receiver window to direct sunlight. This may adversely affect its operation.
- Use of certain fluorescent lamp in the same room may interfere with transmission of the signal.
- Do not leave the remote control in direct sunlight or near a heater. Protect the remote control from moisture and shock.

### ON / OFF MODE

Use this mode when the remote control is not available.

#### TO TURN ON

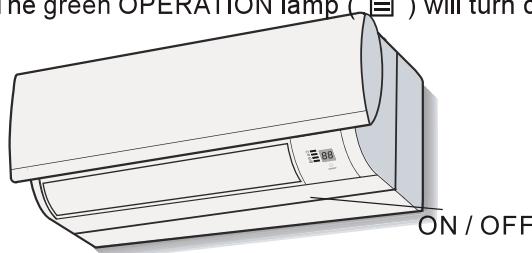
**Press the ON / OFF button.**

- The green OPERATION lamp (■) will light up and the unit will start operating in the AUTO mode.
- The fan speed and temperature setting are set to AUTO.

#### TO TURN OFF

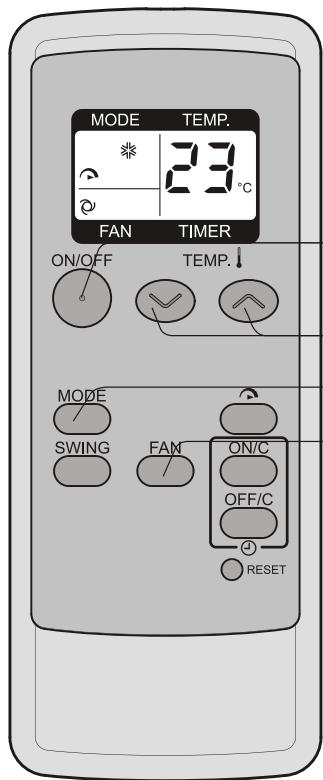
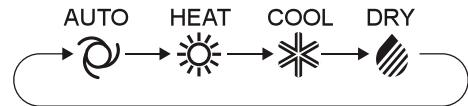
**Press the ON / OFF button again.**

- The green OPERATION lamp (■) will turn off.



## BASIC OPERATION

**1** Press the MODE button to select the operation mode.



**2** Press the ON/OFF button to start operation.

- The green OPERATION lamp (■) will light up.

### TO TURN OFF

Press the ON/OFF button again.

- The green OPERATION lamp (■) will turn off.

**3** Press the TEMPERATURE button to set the desired temperature.

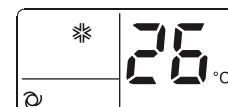
(AUTO/DRY mode)

The temperature can be changed up to  $\pm 2$  °C from the automatically set of temperature.



(COOL/HEAT mode)

The temperature setting range: 18-32 °C.



**4** Press the FAN button to set the desired fan speed.



### NOTE:

#### AUTO MODE

In the AUTO mode, the temperature setting and mode are automatically selected according to the room temperature and outdoor temperature when the unit is turned on.

During operation, if the outdoor temperature changes, the temperature settings will automatically change.

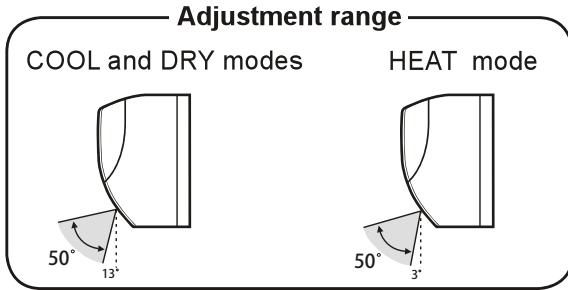
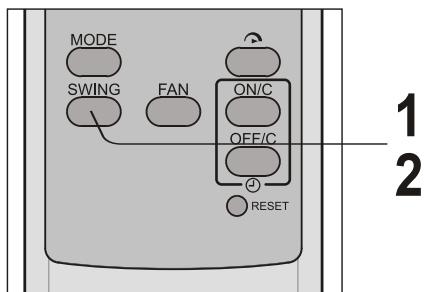
#### DRY MODE

The fan speed is preset to AUTO and cannot be changed.

## ADJUSTING THE AIR FLOW DIRECTION

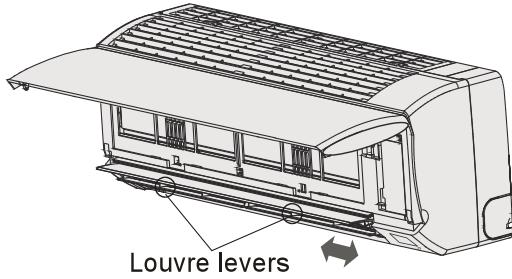
### VERTICAL AIR FLOW DIRECTION

- 1 Press the SWING button.**
  - The vertical airflow louvre will swing.
- 2 Press the SWING button again to stop at the desired position.**



### HORIZONTAL AIR FLOW DIRECTION

Adjust the horizontal air flow direction with the louver lever.



#### **CAUTION:**

- Never attempt to adjust the vertical airflow louvre manually.
- Manual adjustment of the vertical airflow louvre can cause the unit to malfunction.
  - When the vertical adjustment louvre is positioned at the lowest position in the COOL or DRY mode for an extended period of time, condensation may result.

## FULL POWER OPERATION

The air conditioner works at the maximum power to make the room cool or warm rapidly.

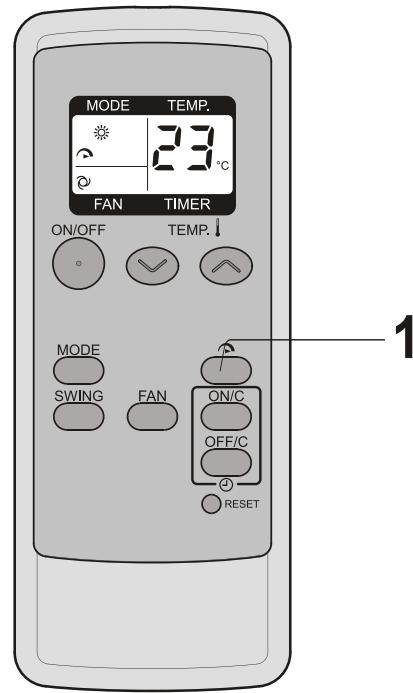
- 1 During cooling and heating operation, press the FULL POWER button.**

- The remote control will display “”.
- The yellow FULL POWER lamp ( ) will light up.

### TO CANCEL

Press the FULL POWER button again.

- The yellow FULL POWER lamp ( ) will turn off.



#### **NOTE:**

- The air conditioner will operate at “Extra HIGH” fan speed for 5 minutes, and then shift to “HIGH” fan speed.
- You can set the temperature during the FULL POWER operation.

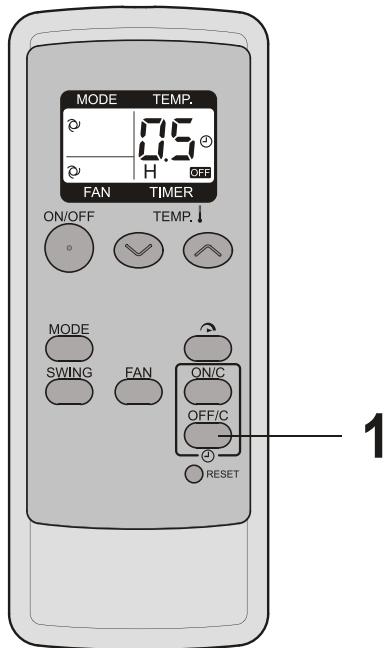
## TIMER OPERATION

### TIMER OFF

**1 Press the TIMER OFF button and set the time as desired.**

→ 0.5h → 1.0h → 1.5h → 10h → 11h → 12h

- The yellow TIMER lamp (⊕) will light up.
- The time setting will count down to show the remaining time.

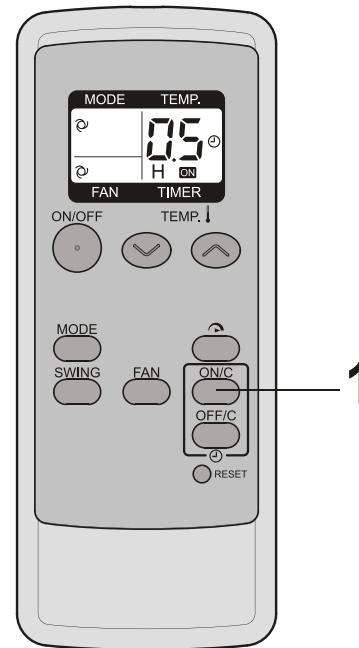


### TIMER ON

**1 Press the TIMER ON button and set the time as desired.**

→ 0.5h → 1.0h → 1.5h → 10h → 11h → 12h

- The yellow TIMER lamp (⊕) will light up.
- The time setting will count down to show the remaining time.



### NOTE:

- Timer duration can be set from a minimum half an hour to a maximum of 12 hours. Up to 9.5 hours, you can set in half-hour increments, and from 10 to 12 hours, in 1-hour increments.
- The TIMER OFF and TIMER ON can not be set together.
- When the temperature is set during timer setting, the temperature will show in the display for 5 seconds and then return to the timer display.

## TIPS ON SAVING ENERGY

Below are some simple ways to save energy when you use your air conditioner.

### **Set the proper temperature**

- Setting to higher or lower than necessary temperature point will result in increased power consumption.

### **Block direct sunlight and prevent drafts**

- Blocking direct sunlight during cooling operation will reduce power consumption.
- Close the windows and doors during cooling and heating operations.

### **Keep filter clean to ensure the most efficient operation**

### **Turn off the circuit breaker when the unit is not used for an extended period of time**

- The indoor unit still consumes a small amount of power when it is not operating.

## NOTE ON OPERATION

### OPERATING CONDITION

|         |             | INDOOR TEMP. | OUTDOOR TEMP. |
|---------|-------------|--------------|---------------|
| COOLING | Upper limit | -            | 46 °C         |
|         | Lower limit | 21 °C        | 18 °C         |
| HEATING | Upper limit | 27 °C        | 24 °C         |
|         | Lower limit | -            | -7 °C         |

- The built-in protective device may prevent the unit from operating when used at higher temperature than this range.
- Condensation may form on the air outlet if the unit operates continuously in the COOL or DRY mode when humidity is over 80 %.

### WHEN POWER FAILURE OCCURS

- This air conditioner has a memory function to store settings when a power failure occurs. After power recovery, the unit will automatically re-start in the same settings which were active before the power failure, except for timer settings.
- If a power failure occurs while the timer is set, the timer setting will be cancelled and will not be retrieved even after the power is restored.

## NOTE ON HEATING OPERATION

### **DEFROSTING FUNCTION**

- When frost forms on the outdoor unit during heating operation, the unit operate automatic defrosting for about 5 to 10 minutes to remove the frost. During defrosting, the inside and outside fans stop operating.

### **HEATING EFFICIENCY**

- The unit employs a heat pump that draws heat from the outside air and releases it into the room. The outside temperature therefore greatly affects the heating efficiency.
- If the heating efficiency is reduced due to low outside temperatures, use an additional heater.
- It takes time to warm up and heat the entire room because of the forced air circulation system.

# PARTS GUIDE

## ROOM AIR CONDITIONER

### MODEL

INDOOR UNIT

**AY-X9PSR  
AY-X12PSR**

OUTDOOR UNIT

**AE-X9PSR  
AE-X12PSR**

### CONTENTS

- [1] INDOOR UNIT PARTS
- [2] ACCESSORY PARTS
- [3] INDOOR PACKING PARTS

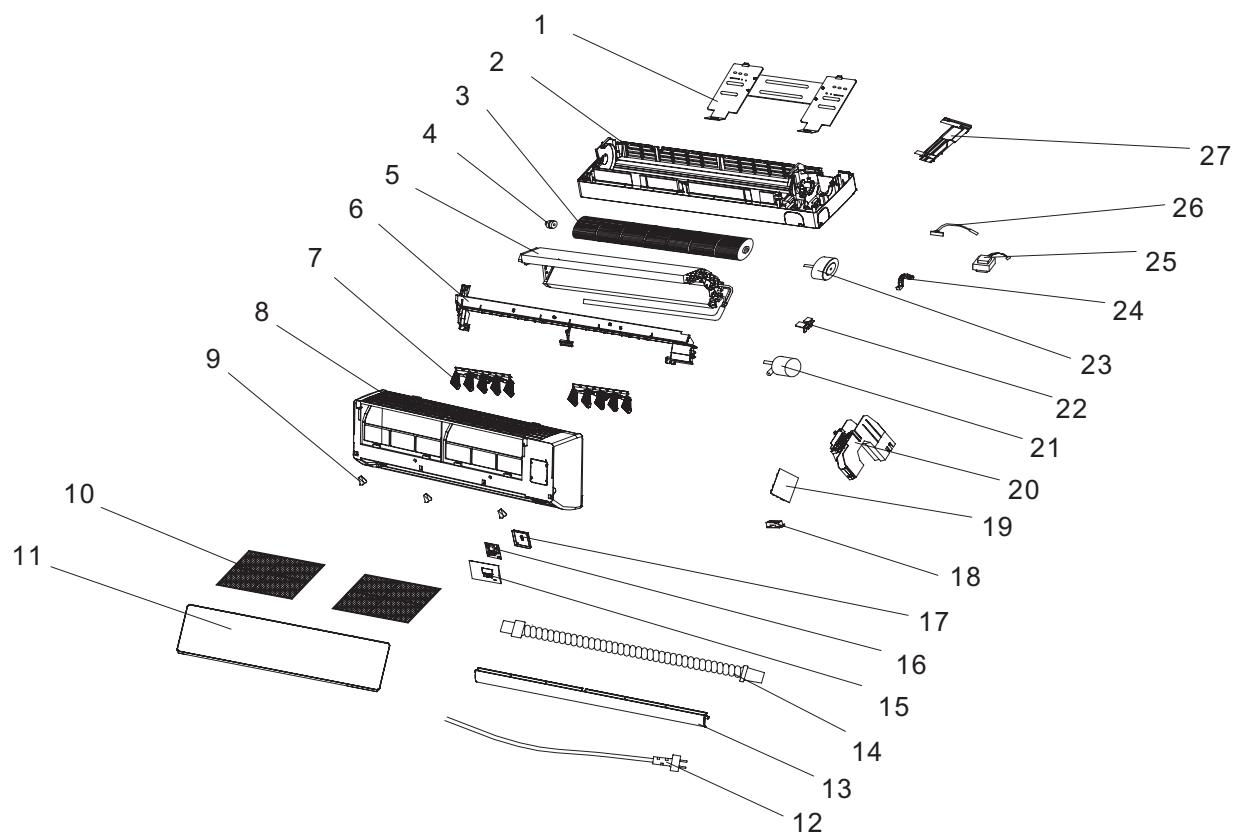
- [4] OUTDOOR UNIT PARTS
- [5] OUTDOOR PACKING PARTS

Parts marked with "⚠" are important for maintaining the safety of the set. Be sure to replace these parts with specified ones for maintaining the safety and performance of the set.

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for after sales service only.  
The contents are subject to change without notice.

## [1] INDOOR UNIT PARTS

**AY-X9PSR/AY-X12PSR**



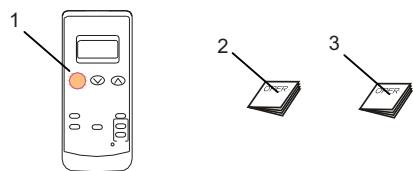
**AY-X9PSR**

| No. | Part No.      | Part Name               | Q'ty | Remark |
|-----|---------------|-------------------------|------|--------|
| 1   | PPLTNA161JBWZ | Installation Plate      | 1    |        |
| 2   | LCHS-A674JBFA | Base                    | 1    |        |
| 3   | NFANCA155JBKZ | Cross Fan               | 1    |        |
| 4   | NBRG-A075JBEZ | Bearing Mount           | 1    |        |
| 5   | DEVA-A582JBKZ | Evaporator              | 1    |        |
| 6   | CSRA-A896JBKZ | Water Drainage Assembly | 1    |        |
| 7   | MLOV-A588JBFA | Vertical Vane Assembly  | 2    |        |
| 8   | GWAK-A420JBFA | Face Frame              | 1    |        |
| 9   | LHLD-B288JBFA | Screw Cover             | 3    |        |
| 10  | PFILMA289JBEA | Air Filter              | 2    |        |
| 11  | HPNL-B314JBRA | Front Panel             | 1    |        |
| 12  | QACC-A362JBZZ | Power Supply Cord       | 1    |        |
| 13  | MLOV-A589JBFA | Vane                    | 1    |        |
| 14  | PHOS-A067JBEZ | Drainage Hose           | 1    |        |
| 15  | CDECQA084JBKZ | Display PCB Cover       | 1    |        |
| 16  | RLCDSA127JBZZ | Display PCB             | 1    |        |
| 17  | HDECQA533JBFA | Display PCB Box         | 1    |        |
| 18  | LHLD-B289JBFA | Cable Clamp             | 1    |        |
| 19  | DSGY-F199JBKZ | Main PCB                | 1    |        |
| 20  | DBOX-A156JBKZ | Electrical Box          | 1    |        |
| 21  | CMOTLB546JBEZ | Vane Motor              | 1    |        |
| 22  | LHLD-B290JBFZ | Sensor Holder           | 1    |        |
| 23  | CMOTLB547JBEZ | Indoor Motor            | 1    |        |
| 24  | PCOV-C123JBFZ | Indoor Motor Cover      | 1    |        |
| 25  | RTRNWA070JBZZ | Transformer             | 1    |        |
| 26  | RH-HXA191JBZZ | Indoor Sensor Assembly  | 1    |        |
| 27  | PCOV-C124JBFZ | In And Out Pipe Fixer   | 1    |        |

**AY-X12PSR**

| No. | Part No.      | Part Name               | Q'ty | Remark |
|-----|---------------|-------------------------|------|--------|
| 1   | PPLTNA161JBWZ | Installation Plate      | 1    |        |
| 2   | LCHS-A674JBFA | Base                    | 1    |        |
| 3   | NFANCA155JBKZ | Cross Fan               | 1    |        |
| 4   | NBRG-A075JBEZ | Bearing Mount           | 1    |        |
| 5   | DEVA-A583JBKZ | Evaporator              | 1    |        |
| 6   | CSRA-A896JBKZ | Water Drainage Assembly | 1    |        |
| 7   | MLOV-A588JBFA | Vertical Vane Assembly  | 2    |        |
| 8   | GWAK-A420JBFA | Face Frame              | 1    |        |
| 9   | LHLD-B288JBFA | Screw Cover             | 3    |        |
| 10  | PFILMA289JBEA | Air Filter              | 2    |        |
| 11  | HPNL-B314JBRA | Front Panel             | 1    |        |
| 12  | QACC-A362JBZZ | Power Supply Cord       | 1    |        |
| 13  | MLOV-A589JBFA | Vane                    | 1    |        |
| 14  | PHOS-A067JBEZ | Drainage Hose           | 1    |        |
| 15  | CDECQA084JBFA | Display PCB Cover       | 1    |        |
| 16  | RLCDSA127JBZZ | Display PCB(Digital)    | 1    |        |
| 17  | HDECQA533JBFA | Display PCB Box         | 1    |        |
| 18  | LHLD-B289JBFA | Cable Clamp             | 1    |        |
| 19  | DSGY-F199JBKZ | Main PCB(Digital)       | 1    |        |
| 20  | DBOX-A156JBKZ | Electrical Box          | 1    |        |
| 21  | CMOTLB546JBEZ | Vane Motor              | 1    |        |
| 22  | LHLD-B290JBFZ | Sensor Holder           | 1    |        |
| 23  | CMOTLB547JBEZ | Indoor Motor            | 1    |        |
| 24  | PCOV-C123JBFZ | Indoor Motor Cover      | 1    |        |
| 25  | RTRNWA070JBZZ | Transformer             | 1    |        |
| 26  | RH-HXA191JBZZ | Indoor Sensor Assembly  | 1    |        |
| 27  | PCOV-C124JBFZ | In And Out Pipe Fixer   | 1    |        |

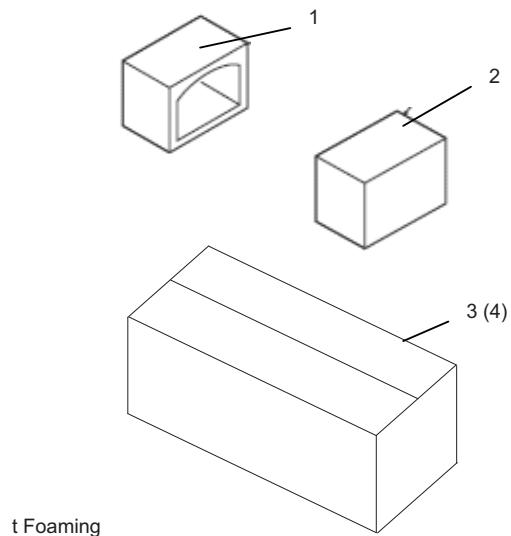
## [2] ACCESSORY PARTS



ACCESSORY PARTS

| No. | Part No.      | Part Name          | Q'ty | Remark |
|-----|---------------|--------------------|------|--------|
| 1   | CRMC-A891JBEZ | REMOTE CONTROL     | 1    |        |
| 2   | TINSJB281JBRZ | INSTALLTION MANUAL | 1    |        |
| 3   | TINSJB280JBRZ | OPERATION MANUAL   | 1    |        |

## [3] INDOOR UNIT PARTS

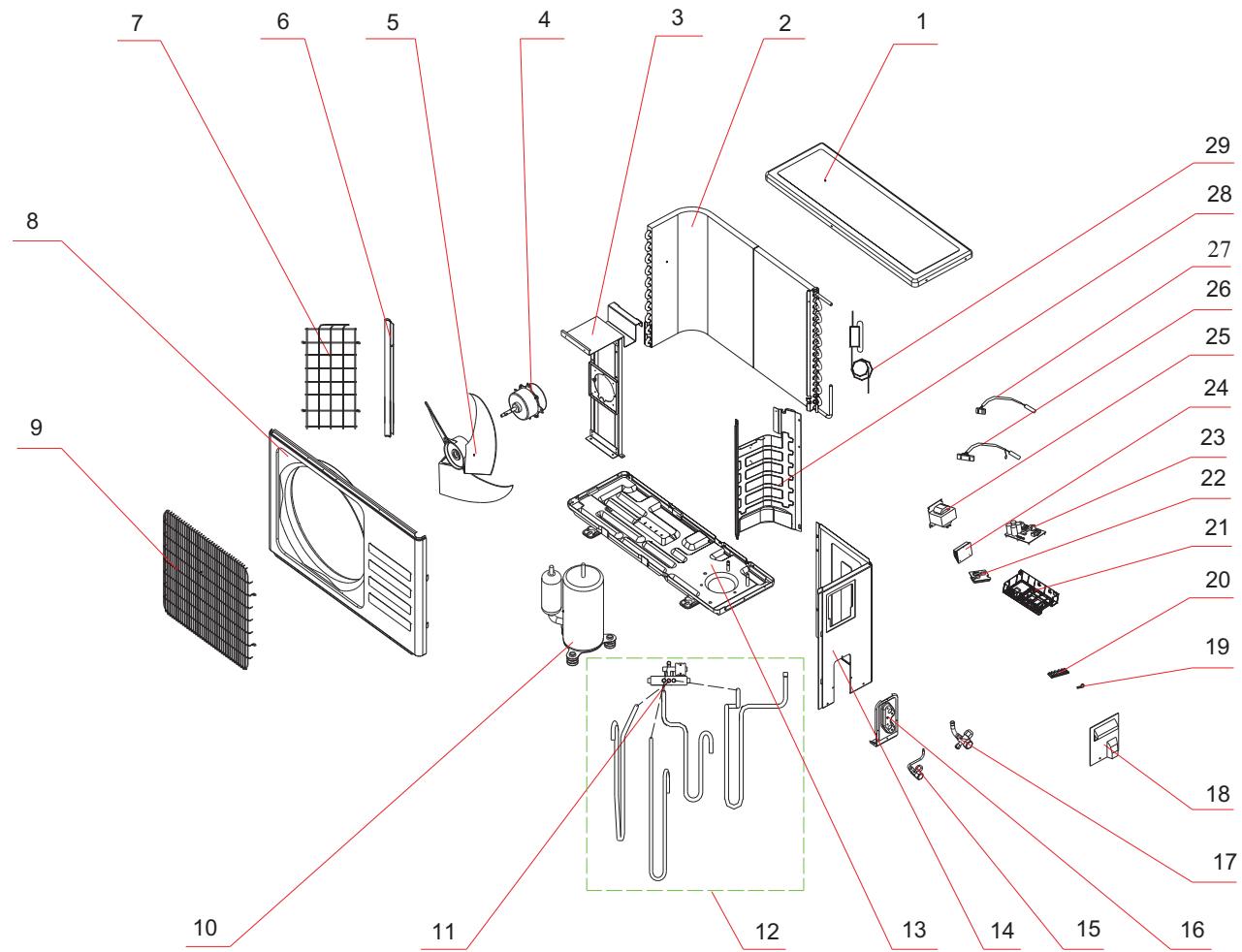


INDOOR PACKING PARTS

| No. | Part No.      | Part Name     | Q'ty | Remark        |
|-----|---------------|---------------|------|---------------|
| 1   | SPADBA703JBEZ | Left Foaming  | 1    |               |
| 2   | SPADBA703JBEZ | Right Foaming | 1    |               |
| 3   | SPAKCE433JBEZ | Indoor Carton | 1    | for AY-X9PSR  |
| 4   | SPAKCE466JBEZ | Indoor Carton | 1    | for AY-X12PSR |

## [4] OUTDOOR UNIT PARTS

AE-X9PSR/AE-X12PSR

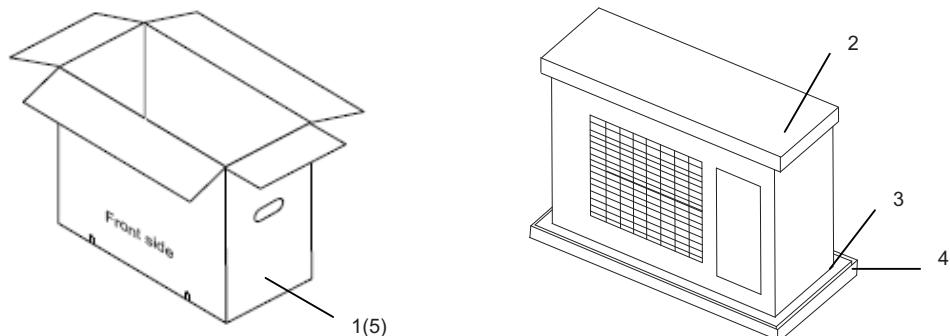


**AE-X9PSR**

| No. | Part No.      | Part Name                                  | Q'ty | Remark           |
|-----|---------------|--|------|------------------|
| 1   | CCAB-A597JBKZ | Top cover                                  | 1    |                  |
| 2   | DCoN-A784JBPZ | Condenser                                  | 1    |                  |
| 3   | LANGKA345JBPZ | Outdoor motor supporter                    | 1    |                  |
| 4   | CMoTLB548JBEZ | Outdoor motor                              | 1    |                  |
| 5   | NFANPA154JBEZ | Propeller fan                              | 1    |                  |
| 6   | PPLT-A990JBTA | Left grille supporter                      | 1    |                  |
| 7   | GGADUA015JBEA | Left grille                                | 1    |                  |
| 8   | GCAB-A486JBTA | Front plate                                | 1    |                  |
| 9   | GGADPA028JBFA | Fan guard                                  | 1    |                  |
| 10  | FCMPRA374JBKZ | Compressor and accessories                 | 1    |                  |
| 11  | FVLV-A301JBKZ | 4-way valve                                | 1    |                  |
| 12  | CVLV-B263JBKZ | 4-way valve assembly                       | 1    |                  |
| 13  | CCHS-B413JBYZ | Base                                       | 1    |                  |
| 14  | PPLT-A991JBTA | Right plate                                | 1    |                  |
| 15  | DVLV-B426JBKZ | Two-way valve                              | 1    |                  |
| 16  | PPLT-A992JBPZ | Valve supporter                            | 1    |                  |
| 17  | DVLV-B425JBKZ | Three-way valve                            | 1    |                  |
| 18  | JHNDPA035JBFA | Electrical box cover                       | 1    |                  |
| 19  | LHLD-AA01SRFZ | Cable clamp                                | 1    |                  |
| 20  | PDAi-A304JBWZ | Terminal                                   | 1    |                  |
| 21  | PBoX-A604JBPZ | Electrical box                             | 1    | this is assembly |
| 22  | QTANZA097JBZZ | Power source board                         | 1    |                  |
| 23  | DSGY-F210JBKZ | Inverter module                            | 1    |                  |
| 24  | LANGKA344JBPZ | Radiator                                   | 1    |                  |
| 25  | RCiLZA059JBZZ | Inductor                                   | 1    |                  |
| 26  | RH-HXA194JBZZ | Pipe Temp. sensor and outdoor Temp. sensor | 1    |                  |
| 27  | RH-HXA195JBZZ | Discharge Temp. sensor                     | 1    |                  |
| 28  | PSKR-A423JBPZ | Partition plate                            | 1    |                  |
| 29  | CCPY-A333JBKZ | Capillary assembly                         | 1    |                  |

**AE-X12PSR**

| No. | Part No.      | Part Name                                     | Q'ty | Remark           |
|-----|---------------|---|------|------------------|
| 1   | CCAB-A597JBKZ | Top cover                                     | 1    |                  |
| 2   | DCON-A785JBPZ | Condenser                                     | 1    |                  |
| 3   | LANGKA345JBPZ | Outdoor motor supporter                       | 1    |                  |
| 4   | CMOTLB548JBEZ | Outdoor motor                                 | 1    |                  |
| 5   | NFANPA154JBEZ | Propeller fan                                 | 1    |                  |
| 6   | PPLT-A990JBTA | Left grille supporter                         | 1    |                  |
| 7   | GGADUA015JBEA | Left grille                                   | 1    |                  |
| 8   | GCAB-A486JBTA | Front plate                                   | 1    |                  |
| 9   | GGADPA028JBFA | Fan guard                                     | 1    |                  |
| 10  | FCMPRA375JBKZ | Compressor and accessories                    | 1    |                  |
| 11  | FVLV-A301JBKZ | 4-way valve                                   | 1    |                  |
| 12  | CVLV-B264JBKZ | 4-way valve assembly                          | 1    |                  |
| 13  | CCHS-B413JBYZ | Base  | 1    |                  |
| 14  | PPLT-A991JBTA | Right plate                                   | 1    |                  |
| 15  | DVLV-B426JBKZ | Two-way valve                                 | 1    |                  |
| 16  | PPLT-A992JBPZ | Valve supporter                               | 1    |                  |
| 17  | DVLV-B427JBKZ | Three-way valve                               | 1    |                  |
| 18  | JHNDPA035JBFA | Electrical box cover                          | 1    |                  |
| 19  | LHLD-AA01SRFZ | Cable clamp                                   | 1    |                  |
| 20  | PDAI-A304JBWZ | Terminal                                      | 1    |                  |
| 21  | PBOX-A604JBPZ | Electrical box                                | 1    | this is assembly |
| 22  | QTANZA098JBZZ | Power source board                            | 1    |                  |
| 23  | DSGY-F210JBKZ | Inverter module                               | 1    |                  |
| 24  | LANGKA344JBPZ | Radiator                                      | 1    |                  |
| 25  | RCILZA059JBZZ | Inductor                                      | 1    |                  |
| 26  | RH-HXA194JBZZ | Pipe Temp. sensor and outdoor<br>Temp. sensor | 1    |                  |
| 27  | RH-HXA195JBZZ | Discharge Temp. sensor                        | 1    |                  |
| 28  | PSKR-A423JBPZ | Partition plate                               | 1    |                  |
| 29  | CCPY-A334JBKZ | Capillary assembly                            | 1    |                  |

**[5] OUTDOOR PACKING PARTS**

PACKING PARTS

| No. | Part No.      | Part Name      | Q'ty | Remark        |
|-----|---------------|----------------|------|---------------|
| 1   | SPAKCE434JBEZ | Cabinet carton | 1    | for AE-X9PSR  |
| 2   | SPADBA706JBFZ | Cover foaming  | 1    |               |
| 3   | SPADBA705JBFZ | Base foaming   | 1    |               |
| 4   | SPAKCE435JBEZ | Base carton    | 1    |               |
| 5   | SPAKCE468JBEZ | Cabinet carton | 1    | for AE-X12PSR |