

Outdoor Unit with DC Inverter

Installation and Owner's Manual

Applicable Types: BE-F44-CLASS24E
BE-F44-CLASS36E

Dear users:

This Manual is the universal version for DC variable frequency outdoor units. If the appearance of your air conditioner is different from that of the air conditioner in the Manual, it will not affect its operation and use.

Please read this Manual before use carefully, and keep this Manual well for future reference.

The air conditioner should be installed by professional engineering team to protect your legal rights.

Contents

| | |
|--|----|
| 1 Safety Precaution | 1 |
| 2 Key Points for Construction Inspection | 1 |
| 3 Installation of Outdoor Unit | 2 |
| 4 Installation of Connecting Pipe | 4 |
| 5 Electrical Wiring | 7 |
| 6 Trial Run | 11 |

1 Safety Precaution



WARNING

- * **This air conditioner is a comfortable unit. Don't use it in some special places for machine rooms, precise instruments, foods, plants, animals, artworks, etc.**
- The installation shall be done by the distributor or the professional staff. The installation staff must have related professional knowledge. Misoperation in the self-installation will result in fire, electric shock, injury, water leak, etc.
- If the air conditioner is installed in a small room, some proper measures shall be taken to make sure that the concentration of refrigerant leak in the room shall not exceed the critical level. For detailed measures, please consult the distributor.
- When connecting the power supply, comply with the regulations specified by the local power company. According to the law, the ground wire must be connected. The misconnection of the ground wire will result in electric shock.
- If the air conditioner needs to be moved or reinstalled, please inform the distributor or the professional staff to operate. Incorrect installation will result in fire, electric shock, injury, water leak, etc.
- The users are not permitted to rebuild or repair the air conditioner by their own. Incorrect repair will result in fire, electric shock, injury, water leak, etc.. Please inform the distributor or the professional staff to repair.



NOTE

- Make sure the water drainage ditch is useable.
- Make sure a current leakage protection switch is equipped. The current leakage protection switch must be equipped. If not, an electric shock will take place.
- It mustn't be installed in any potential leakage location of inflammable gas. In case of the inflammable gas leak around the outdoor unit, a fire takes place.
- Make sure the foundation and hoisting are firm and reliable. If not, it will result in a falling accident.
- Make sure all cables are correctly connected. The misconnection of the cables will result in the damage of electrical components.
- Pre-installation exposure to water or other moistures will result in short circuit of its electrical components.. Don't store it in any damp cellar or expose it to rain or water.
- In case of the refrigerant leaks during installation, the room must be ventilated at once. If the leaked refrigerant is exposed to flame, some toxic gases will be generated.
- After installation, make sure the refrigerant is not leaked.
- If the refrigerant gas in the room is exposed to flame source, such as a heater, a stove or an electric cooker, some toxic gases will be generated..
- A lightning protection device must be equipped according to national laws and regulations against the lightning strike.

2 Key Points for Construction Inspection

2.1 Arrival of goods and open-case inspection

- 1) When receiving the machine, check if there is any damage in transportation. If any surface or internal damage is found, please inform the transportation agency in a written form.
- 2) After receiving the machine, check if the type, specification and quantity of the machine conform to the contract.
- 3) When unpacking the product, please keep the Manual well and check all accessories.

2.2 Refrigerant pipe

- 1) The refrigerant pipe must be installed by the special refrigerant distributor made by our company (purchase).
- 2) The refrigerant pipe must use the pipe with specified diameter and wall thickness.
- 3) The welding of the copper pipe must be performed with nitrogen-filled protection. Before welding, the copper pipe must be filled with the nitrogen of 2.84PSI. After welding, the nitrogen must be cut off until the copper pipe is thoroughly cooled down.
- 4) The refrigerant pipe must be treated with thermal insulation.
- 5) After the refrigerant pipe is installed and before the air tightness test and vacuumization are performed, the indoor unit cannot be power-on.

2.3 Air tightness test

After the refrigerant pipe is installed, nitrogen of 569PSI must be filled from the gas side and liquid side simultaneously for 24-hour air tightness test.

2.4 Vacuumizing

After the air tightness test, vacuumization (-14.5PSI) must be performed from both the gas side and the liquid side simultaneously.

2.5 Refilling of refrigerant

- 1) The refilling volume of refrigerant is calculated by the diameter and length (actual length) of the pipe at the liquid sides of the indoor and outdoor units.
- 2) The refilling volume of refrigerant, diameter and length (actual length) of liquid pipe, and height difference of the indoor and outdoor units shall be recorded into the use confirmation table of the outdoor unit (on the cover plate of electronic control box) for future reference.

2.6 Electrical wiring

- 1) The power supply capacity and wire diameter shall be selected according to the design manual. Generally, the power line of the air conditioner is thicker than that of the motor.
- 2) To prevent misoperation of the air-conditioner, don't interlace or wind the power line (208-230V/60Hz/1N) with the connecting wires (low-voltage wires) of the indoor and outdoor units.
- 3) The indoor unit is power-on after air tightness test and vacuumization.

2.7 Trial Run

- 1) Trial run cannot be performed until the outdoor unit is power-on for more than 12 hours, or the system may be damaged.

3 Installation of Outdoor Unit



WARNING

- The air conditioner must be installed in the place, which is strong enough to support the weight of the machine.
- If it is not strong enough, the machine may fall down and cause some personal injury.
- The special installation must be performed against strong wind or earthquake.
- The falling-down because of incorrect installation may cause some accidents.
- Before installation, please pay attention to choose the matched indoor unit, if you want to match other brands of indoor unit, please let us know.

3.1 Selection of installation position

- 1) Enough space for installation and maintenance.
- 2) No barrier at the air inlet and the air outlet and away from strong wind.
- 3) Dry and ventilated.
- 4) The flat supporting surface is able to bear the weight of the outdoor unit. The outdoor unit shall be horizontally installed, without any noise or vibration.
- 5) Neighbors shall not be influenced by running noise and exhaust gas.
- 6) Without inflammable gas leak;
- 7) Convenient for installation of connecting pipe and electrical connection.

3.2 Dimensional drawing of outdoor unit (Unit: inch)

- 1) Fig. 3-1 is applicable for models of 24K/36K

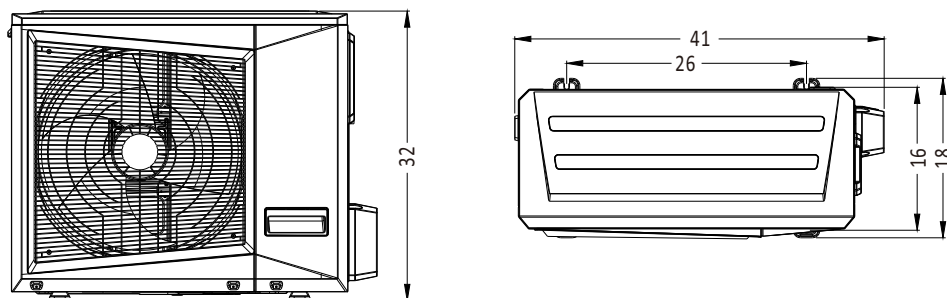


Fig. 3-1 Dimension of Outdoor Unit

3.3 Hoisting of outdoor unit

- 1) Don't remove any package upon hoisting. Two ropes (more than 3") shall be used to hoist the well-packaged machine stably and safely. If there is no package or the packaging material is broken, use some backing plates or packaging materials to protect the machine.
- 2) The outdoor unit shall be carried and hoisted vertically, within an inclination of less than 15 degrees. Care should be taken to safety during carrying and hoisting the machine.
- 3) The gravity of the machine is not in the center, so be careful to hoist the machine.
- 4) Don't hold the suction inlet of the housing, or it will be deformed.

3.4 Installation and maintenance space of outdoor unit

- 1) Provide a firm and adequate foundation to:
 - ① Prevent the outdoor unit from being sunken;
 - ② Prevent the outdoor unit from abnormal noise.
- 2) Foundation types
 - ① Steel structure
 - ② Concrete structure (Common practice is shown in the Fig.below)(Unit:inch)

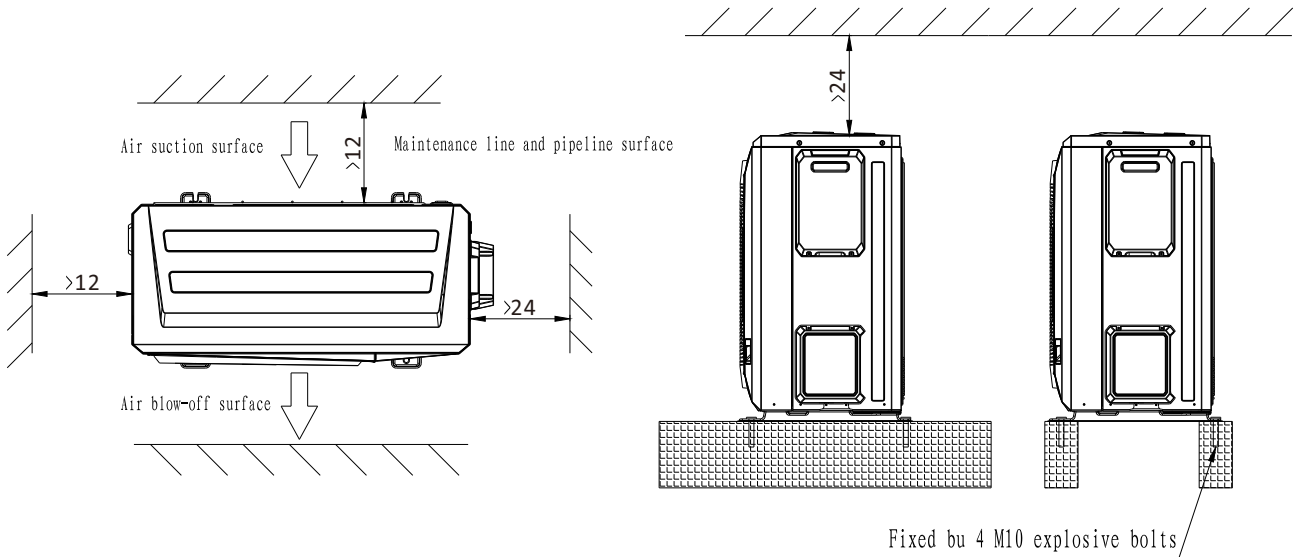


Fig 3-4 Space schematic diagram I for installation and maintenance of outdoor unit

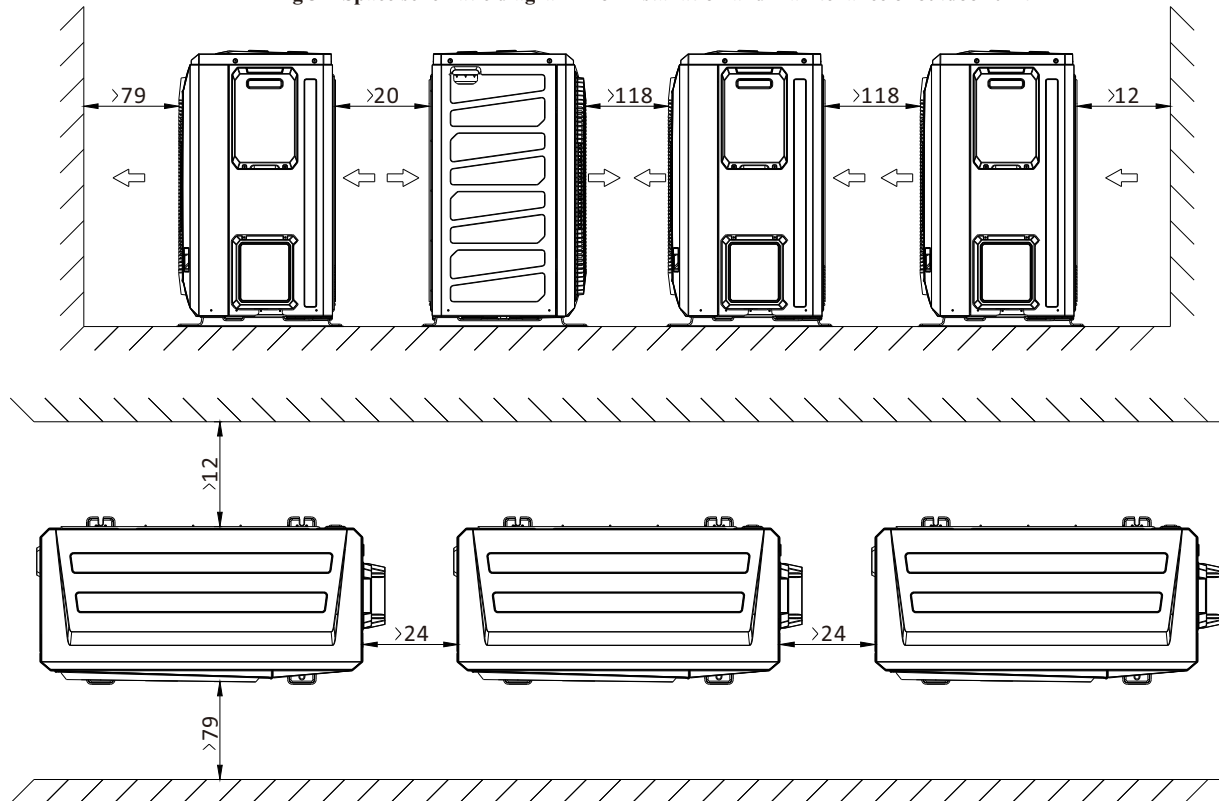


Fig 3-5 Space schematic diagram II for installation and maintenance of outdoor unit

3.5 Position and installation of outlet pipe

- 1) These models of 24K/36K directly use the external globe valves to take over.

4 Installation of Connecting Pipe

4.1 Refrigerant Line Brazing

- 1) Remove caps or plugs. Use a deburring tool to deburr the pipe ends. Clean both internal and external surfaces of the tubing using an emery cloth.
- 2) Remove the pressure tap cap from both service valves.
- 3) Purge the refrigerant lines and indoor coil with dry nitrogen.
- 4) Wrap a wet rag around the valve body to avoid heat damage and continue the dry nitrogen purge.

Braze the refrigerant lines to the service valves.

Check liquid line filter drier's directional flow arrow to confirm correct direction of refrigeration flow (away from outdoor unit and toward evaporator coil) as illustrated. Braze the filter drier to the Liquid Line.

Continue the dry nitrogen purge. Do not remove the wet rag until all brazing is completed.

Important: Remove the wet rag before stopping the dry nitrogen purge.

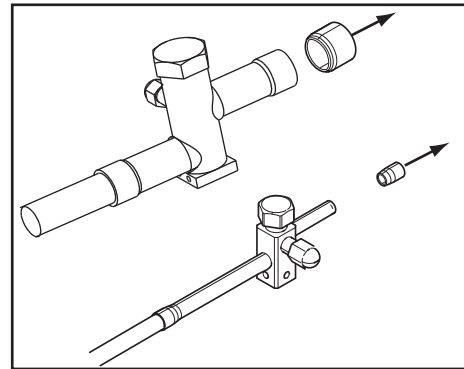


Fig 4-1 Remove caps or plugs.

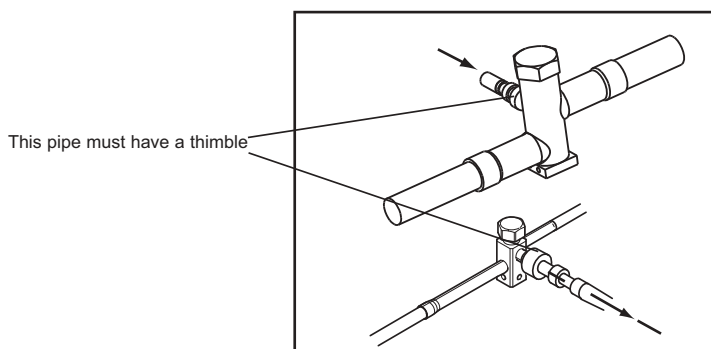


Fig 4-2 Purge the refrigerant lines and indoor coil with dry nitrogen.

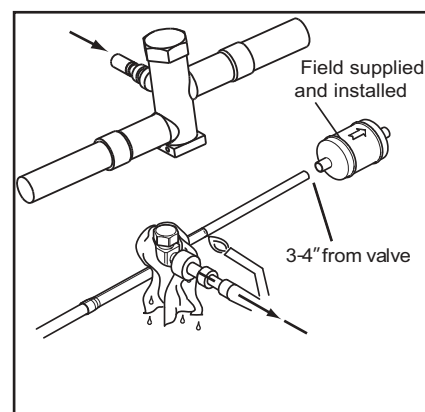


Fig 4-3 Wrap a wet rag around the valve body to avoid heat damage and continue the dry nitrogen purge.

NOTE

- To prevent the copper pipe from internal oxidation upon welding, the copper pipe shall be filled with nitrogen. Otherwise, the oxide skin will block the refrigeration system!
- When fastening the nut, too strong force will damage the flared socket, but too weak force will result in leakage. Please refer to the tightening torque in the table above to fasten the nuts!
- For outdoor unit 24K/36K, their connections are braze type, tube size should always be the same diameter as the connections provided at the service valves. Up sizing of lines can result in inadequate oil return to the compressor and excessive refrigerant charge and will void the warranty.

4.2 Remove foreign materials in the pipeline.

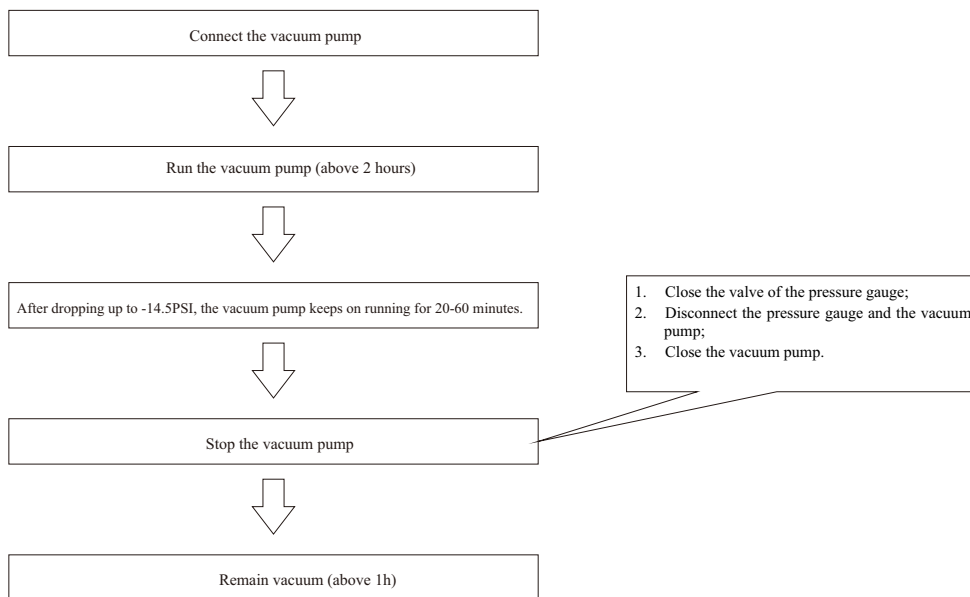
- 1) The foreign materials, which enter the refrigerant pipe during installation, shall be cleaned with high pressure nitrogen.
- 2) Don't connect with the indoor unit upon cleaning.
- 3) Use the nitrogen instead of refrigerant or flammable toxic gases like oxygen.

4.3 Refrigerant Line Leak Check.

- 1) Pressurize the refrigerant lines and evaporator coil to 150 PSIG using dry nitrogen.
- 2) Check for leaks by using a soapy solution or bubbles at each brazed location.
- 3) Don't connect with the outdoor unit during maintaining the pressure.

4.4 Vacuumizing

- 1) The vacuum pump has the vacuum degree of less than -14.5PSI and the air displacement of more than 40L/min.
- 2) It is unnecessary to vacuumize the outdoor unit. Don't open the check valves at the gas side and the liquid side of the outdoor unit.
- 3) Make sure the vacuum pump can drop up to -14.5PSI within 2 hours; if it fails to drop up to -14.5PSI after 3 hours, check moisture or air leak.
- 4) The vacuum pump must have a check valve.



NOTE

- Don't use tools and measuring apparatus using in different refrigerants or directly contacting the refrigerant.
- Don't exhaust air with refrigerant gas.
- If the vacuum degree cannot reach -14.5PSI recheck its leakage. If not, keep the vacuum pump on for 1-2h.

4.5 Refilling volume of refrigerant

The refilling volume of refrigerant (R410A) is calculated according to the diameter and length of the pipe at the liquid side of the indoor and outdoor units.

Table 4-3 Refilling Volume of Refrigerant

| Diameters of pipe at the liquid side (inch) | Refilling volume of refrigerant equal to the length of 1m pipe (unit: lbs) |
|---|--|
| $\phi 1/4$ | 0.023 |
| $\phi 3/8$ | 0.040 |

Note: The R410A refrigerant must be weighed by an electronic scale and filled in the liquid state.

4.6 Stop valve instructions

- 1) It is closed when leaving the factory;
- 2) Open the valve counterclockwise or close the valve clockwise with a 1/4" socket head wrench;
- 3) After completing the operation, tighten the valve cover;
- 4) R410A special tool shall be used to vacuumize the valve and fill the refrigerant at the service entrance. Fill the refrigerant at the service entrance at the gas side, and vacuumize the valve at the service entrance at the liquid side and the gas side simultaneously.

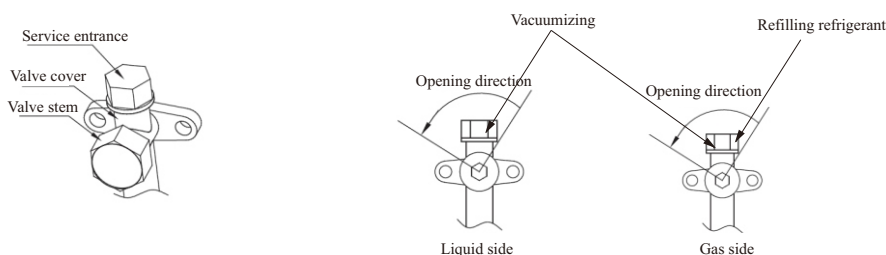


Fig. 4-6 Stop Valve Instructions

4.7 Thermal insulation of pipe

- 1) Apply thermal insulation to the pipes at the gas side and the liquid side respectively;
- 2) Use closed-cell thermal insulation materials, with the flame retardant grade of B1 and high temperature resistance of 120°C;
- 3) Outer diameter of copper pipe $\leq \phi 1/2$ " and thickness of thermal insulation cotton $\geq 3/5$ "; outer diameter of copper pipe $\geq \phi 5/8$ " and thickness of thermal insulation cotton $\geq 4/5$ ".
- 4) The nut joints of the indoor unit shall be performed thermal insulation



NOTE

- The power supplies for the indoor and outdoor units shall be separately designed.
- The power supply must be designed with a sub-circuit, and equipped with a current leakage protector and a manual switch.
- All indoor units in the same system shall be arranged on the same power circuit, and shall be turned on/off the power simultaneously. It is not allowed to equip each indoor unit with a power switch.
- The connecting wire system and the refrigerant pipe system of the indoor unit shall be incorporated into the same system.
- To reduce the interference, the indoor and outdoor communication cables shall use two-core or three-core shielded twisted-pair cables instead of ordinary multi-core cables.
- Conform to related national electrical standards.
- Electrical wiring shall be done by a professional electrician.

5 Electrical Wiring

5.1 Outdoor unit wiring

Table 5-1 Outdoor Unit Wiring

| Power (BTU) | Power Supply | Power Line (mm2) | MCA(A) | Fuse (A) | Signal Wire of Indoor/Outdoor Units (mm) (Signal Wire of Weak Current) |
|-------------|-------------------|------------------|--------|----------|--|
| 24K | 208-230V/1Ph 60Hz | 3×4.0 | 19 | 30 | three-core shielded cable 3×1.0 (two-core shielded cable 2×1.0) |
| 36K | 208-230V/1Ph 60Hz | 3×4.0 | 28 | 45 | three-core shielded cable 3×1.0 (two-core shielded cable 2×1.0) |

Apply To CEILING-MOUNTED CASSETTE TYPE UNIT
or CEILING &FLOOR AIR-CONDITIONING UNIT

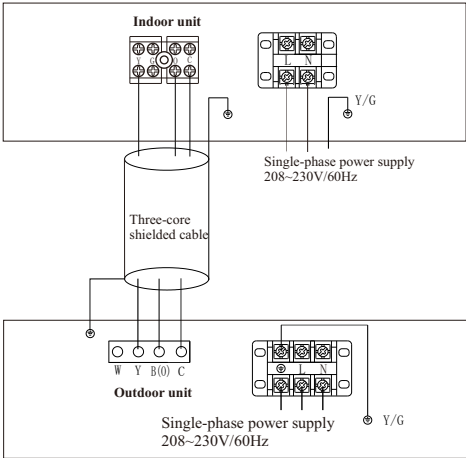


Fig. 5-1 Electrical Wiring of Single-phase HP Outdoor Units

Apply To DUCT TYPE AIR-CONDITIONING UNIT
or AIR-HANDLER

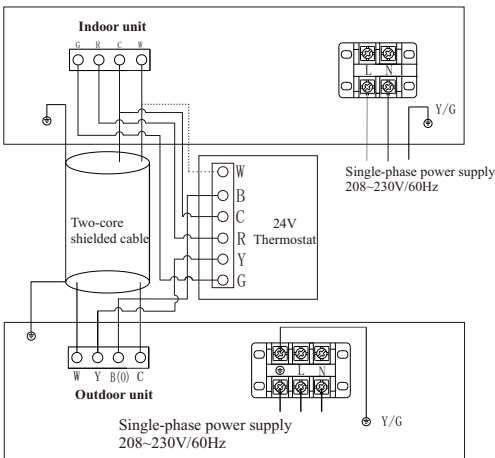


Fig. 5-2 Electrical Wiring of Single-phase HP Outdoor Units

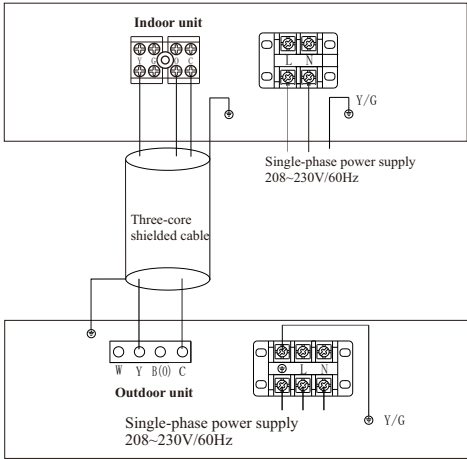


Fig. 5-3 Electrical Wiring of Single-phase AC Outdoor Units

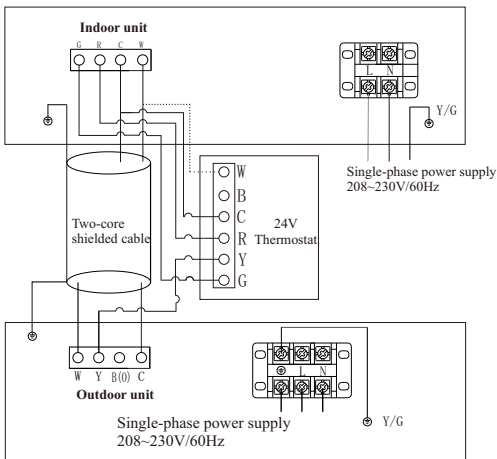


Fig. 5-4 Electrical Wiring of Single-phase AC Outdoor Units

NOTE

- When the signal line uses a three-core shielded cable, the shielding net shall be connected to the ground.
- Never connect the power line (strong current) to the terminal block of the signal line (weak current). Otherwise, the power board will be burnt out.

5.2 Indoor unit power supply wiring

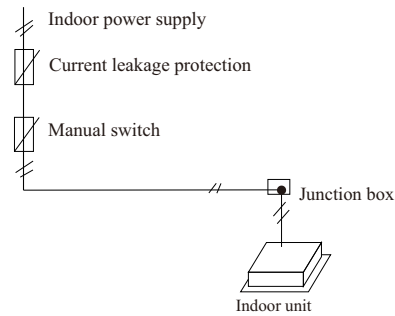


Fig. 5-5 Indoor Unit Power Supply Wiring



When the power line is parallel to the signal line, please put the electrical wires into their own wire pipes, with proper wire spacing (10A or below: 12", 50A or below: 20").

5.3 Indoor unit signal line wiring

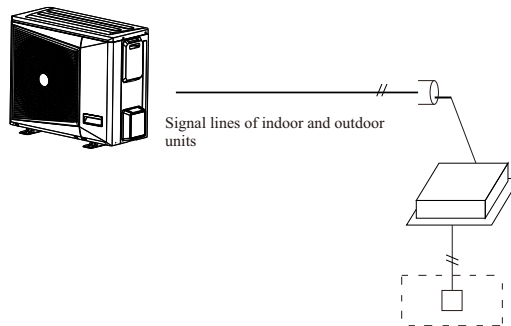


Fig. 5-6 Indoor Unit Power Supply Wiring

If needed, the user can purchase a wire controller, as shown in the dashed box.

- 5.4 Wiring diagram
- For electrical wiring diagram of outdoor unit, refer to the wiring diagram at the side of the right side plate of the outdoor unit.
- 5.5 Dialing setting of main control board
- 5.5.1 Dialing setting of main control board for models of series 24K/36K;

SELECTOR SWITCH (ON-1, OFF-0)

| SW1 | | | |
|--|---|---|---|
| 1 | 2 | 3 | 4 |
| The compressor PI control goal TES/TCS choice (Manufacture only) | | | 0- Cooling EXV throttling (Outdoor) |
| | | | 1- Cooling Spool throttling (Indoor) |

| SW2 | | | |
|---|-------------------------------------|------------|---|
| 1 | 2 | 3 | 4 |
| 0-Automatic defrost 1-Manual defrost | 0-Fahrenheit (°F) 1-Celsius (°C) | No defined | 0- Heating EXV throttling (Outdoor) 1- Heating Spool throttling (Indoor) |

Table 5-7 Inspection Instructions of Outdoor Unit

| NUM | Display Contents | Remarks |
|-----|---|--|
| 00 | Frequency, the number of indoor units, run mode or failure code | |
| 01 | Outdoor power | Model |
| 02 | Run mode | 0:Standby mode; 2: In cooling mode; 3: In heating mode |
| 03 | Target frequency | HZ (Actual value) |
| 04 | Running frequency | HZ (Actual value) |
| 05 | Actual frequency | HZ (Actual value) |
| 06 | Fan speed state | High/low (Actual value) |
| 07 | Temp transform by pressure sensor | °F (Actual value) |
| 08 | T3 condensing temp. | °F (Actual value) |
| 09 | T4 outdoor ambient temp. | °F (Actual value) |
| 10 | T5 exhaust temp. | °F (Actual value) |
| 11 | AC current | A (Actual value) |
| 12 | Compressor current | |
| 13 | AC voltage | VAC (Actual value*2) |
| 14 | DC voltage | VDC (Actual value*2) |
| 15 | EXV opening degree | Step (Actual value/4) |
| 16 | Frequency increase | Shift (Actual value) |
| 17 | EV | Step (Actual value) |
| 18 | Reserved | |
| 19 | IPM modular temp Tfin | °F (Actual value) |
| 20 | Oil output | CC (Actual value/8) |
| 21 | Target temp Tes/Tcs | °F (Actual value) |
| 22 | Pressure value | PSI (Actual value*25) |
| 23 | Pressure valve transform by T3 | PSI (Actual value*25) |
| 24 | Reserved | |
| 25 | Target superheat | °F (Actual value) |
| 26 | Discharge temp superheat | °F (Actual value) |
| 28 | Ability test mode | 1-40 (Mode gear) |
| 29 | Software version number | 1-255 |
| 31 | Enter PI control sign | 0 or 1 |
| 34 | Frequency limit item | |
| 37 | Final fault Code | |

Table 5-8 Outdoor Unit Fault Code

| Fault Code | Fault Contents | Remark |
|------------|---|------------------------------------|
| E4 | Environment temperature sensor error | |
| E6 | Condensate temperature sensor error | |
| E5 | Exhaust temperature sensor error | |
| E9 | AC over-voltage / under-voltage protection | |
| E10 | EEPROM error | |
| E12 | IPM modular sensor error | |
| E13 | Pressure sensor error | |
| E14 | T3 or T5 sensor disconnect error | |
| E15 | High pressure switch error | |
| H0 | Comm. error between main chip and DSP chip | |
| H1 | T3 sensor high temperature error(In cooling mode) | 20 times P5 error within 180mins |
| H2 | High pressure switch error | 20 times P1 error within 150 mins |
| H3 | High pressure abnormal in heating mode | 20 times P13 error within 180 mins |
| H4 | IPM modular high temp error | 20 times P8 within 120 mins |
| H5 | Low pressure error | 20 times P2 within 100 mins |
| H6 | Discharge temperature abnormal error | 20 times P4 within 100 mins |
| H7 | Wet operation error | 20 times P12 within 200 mins |
| H8 | T3 condenser sensor disconnect error | 20 times E14 within 100 mins |
| H12 | Discharge temp sensor disconnect error | 20 times E14 within 180 mins |
| P1 | High pressure protection | |
| P2 | Low pressure protection | |
| P3 | AC over covercurrent | |
| P4 | Excessive exhaust temperature protection | |
| P5 | T3 high temperature protection | |
| P6 | IPM modules protection | |
| P8 | IPM modules high temp Tf protection | |
| P9 | DC fan motor error | |
| P12 | Wet operation error | |
| P13 | High pressure abnormal error(In heating mode) | |
| P14 | High compression ratio protection | |
| P15 | Low compression ratio protection | |
| L1 | DC Low Voltage rotection | |
| L2 | DC High Voltage protection | |
| L4 | MCE fault/synchronous/closed loop | |
| L5 | Zero speed protection | |
| L7 | Deficiency Protection of Compresso | |
| L8 | Compressor stalls | |
| L9 | Frequency limitation or decline by high pressure | |
| LA | Frequency limitation by voltage | |
| LC | Frequency limitation by condenser temp | |
| LD | Frequency limitation by discharge temp | |
| LE | Frequency limitation by IPM modular high temp | |
| LF | Frequency limitation by current | |
| d0 | Oil return | |
| df | Defrost | |
| dH | Force cooling | |

6 Trial Run

6.1 Inspection and confirmation before debugging

- 1) Check and make sure the refrigerating pipeline and communication line connecting with the indoor and outdoor units are connected with the same refrigerating system. Otherwise, some running faults occur. .
- 2) The power supply voltage is within the rated voltage of $\pm 10\%$.
- 3) Check and make sure the power supply line and the control line are correctly connected.
- 4) Before power-on, make sure there is no short circuit.
- 5) Check if all units have passed 24-hour nitrogen pressure-maintaining ($40\text{kgf}/\text{cm}^2$) test.
- 6) Make sure the debugged system is fully vacuumized, dried and filled with the refrigerant as specified.

| | |
|--|------------|
| Indoor unit type | |
| Room name | indoor (A) |
| Example: 2nd floor, first system, indoor (A) | |
| Remark: -2F-1A | |

6.2 Preparation before debugging

- 1) Calculate the refilling volume of refrigerant for each set of units according to the length of on-site liquid pipe.
- 2) Prepare the required refrigerant.
- 3) Prepare the system plan, system piping diagram and control wiring diagram.
- 4) Mark the set address codes on the system plan.
- 5) Turn on the power supply switch of the outdoor unit in advance, and make sure it is power-on for more than 12 hours, so that the heater heats the compressor oil.
- 6) Fully open air pipe check valve, liquid pipe check valve and oil balance valve of the outdoor unit. If they are fully opened, the machine may be damaged.
- 7) Check if the power supply phase sequence of the outdoor unit is correct.
- 8) Check if all dialing switches of the indoor and outdoor units are set according to the technical requirements of the product.

Fig. 6-1 Filling of Names of Connecting Systems

6.3 Filling of names of connecting systems

When the multiple indoor units are arranged, in order to distinguish the connecting systems of indoor and outdoor units, all systems shall be named respectively and recorded on the nameplate on the electronic control box cover of the outdoor unit.

6.4 Precautions against refrigerant leak

- 1) The refrigerant of the air conditioner is harmless and nonflammable.
- 2) The room for the air conditioner shall have an appropriate space. In case of refrigerant leak, it cannot go beyond the critical concentration. In addition, necessary measures can be taken.
- 3) The critical gas concentration harmless to the human body is $0.3\text{ kg}/\text{m}^3$.
- 4) Confirm the critical concentration according to the following steps and take corresponding measures.
 - a) Calculate the filling volume of refrigerant (A[kg])
 Volume of refrigerant = filling volume of refrigerant before delivery (see the nameplate) + refilling volume of refrigerant corresponding to the length of pipe
 - b) Calculate the indoor volume (B [m^3]) (by the minimum volume)
 - c) Calculate the refrigerant concentration: $\frac{A [\text{kg}]}{B [\text{m}^3]} \leq \text{Critical concentration: } 0.3 [\text{Kg}/\text{m}^3]$

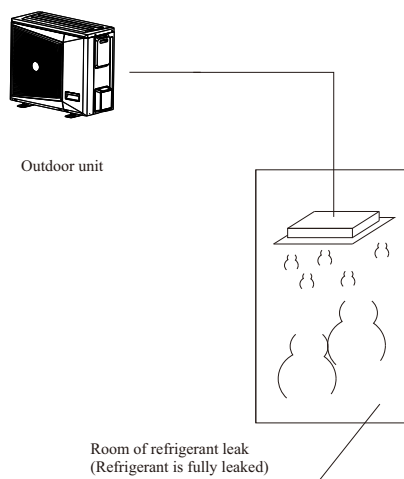
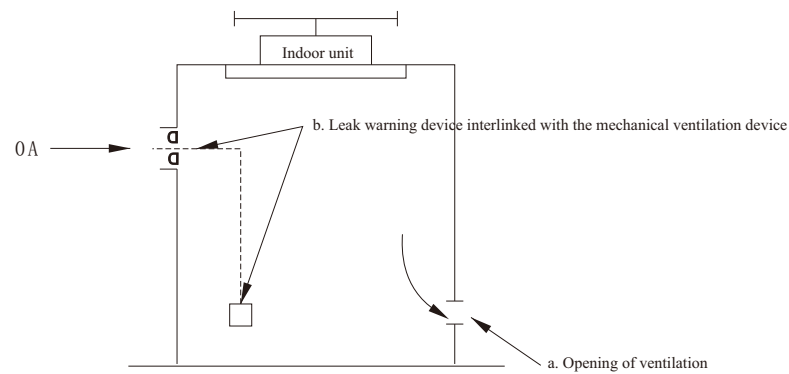


Fig. 6-2 Refrigerant Leak

- 5) Measures against exceeding the critical concentration
 - a) To reduce the refrigerant concentration below the critical concentration, install a mechanical ventilation device (for frequent ventilation).
 - b) If frequent ventilation cannot be performed, please install a leak warning device interlinked with the mechanical ventilation device.



(The leak warning device shall be installed in the gathering place of refrigerant.)

Fig. 6-3 Mechanical Ventilation Device

6.5 Hand over to the client

- 1) Hand over the Use Manual for the Indoor Unit and the Installation Manual for the Outdoor Unit to the client.
- 2) Explain the contents of Use and Installation Manual to the client carefully.

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