

BFFD Maintenance & Service Manual

Preface:

In order to timely and quickly solve air conditioning system faults, ensure normal operation and maximize operation efficiency, Zhengzhou Kelin Motor Vehicle Air Conditioning Co., Ltd hereby prepares this maintenance and troubleshooting manual for reference.

If you have any other questions or comments about this manual, please consult our sales manager. We warmly welcome criticism and correction.

Zhengzhou Kelin Motor Vehicle Air Conditioning Co., Ltd. continuously pursues technological progress and has the right to improve and change the design of products at any time without prior notice.



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Specification of BFFD-06

| | |
|---------------------|-------------------------|
| Cooling capacity | 32000 Kcal/h |
| Evaporator air flow | 7200m ³ /h |
| Condenser air flow | 9500m ³ /h |
| Power consumption | <95A |
| Compressor | BOCK655(DC 24V) |
| Refrigerant | R134a |
| Overall dimension | 4435mm X 1902mm X 210mm |



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1. Tools List:

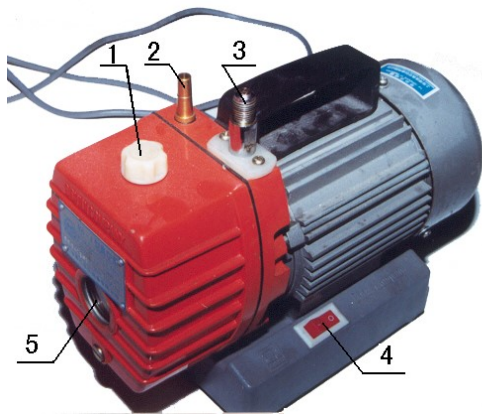
1.1 Manifold pressure gauge

Manifold pressure gauge is a necessary tool used to judge the internal situation and repair the A/C. The refrigerant used by the manifold must be same as A/C system. It should be used together with corresponding hoses. It contains following components:



- 1 **Low pressure gauge**: used to test pressure on the low pressure side of the system, can read the vacuum condition and pressure.
- 2 **High pressure gauge**: used to test pressure on the high pressure side of the system.
- 3 **Low pressure hand valve**: when the valve shuts, 5 and 6 will disconnect; when the valve opens, 5 and 6 connect.
- 4 **High pressure hand valve**: when the valve shuts, 7 and 6 will disconnect; when the valve opens, 7 and 6 connect.
- 5 **Low pressure sided interface**: connected to the low pressure side of the system by hose.
- 6 **Maintenance interface**: connected to the high pressure side of the

1.2 Vacuum pump



- 1 oil filling hole
- 2 air exhausting hole
- 3 vacuum pumping interface
- 4 switch
- 5 oil level sight glass

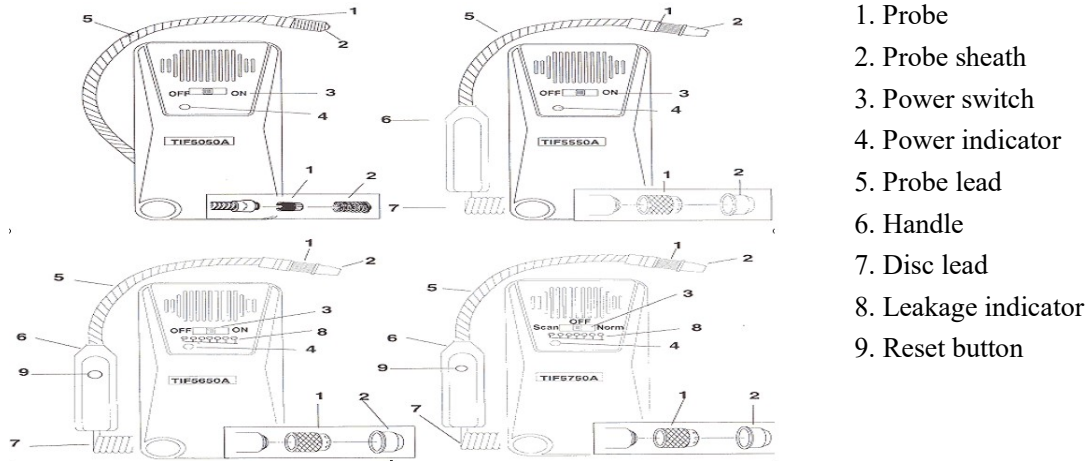
The vacuum pump is used to pump out air and water from the system. When use, connect the manifold pressure gauge first, connect the middle hose of the manifold pressure gauge with the vacuum pump interface, then connect the power, turn on the vacuum pump and then turn on manifold pressure gauge and hand valve.

Before application, please check the oil level of the vacuum pump, make supplement when necessary.

1.3 Leak detector

Leak detector is an instrument with high sensitivity to check whether there is leakage in the system. When in use, first turn on the power switch of the leak detector and place the probe of the leak detector at the place to be tested. If the leak detector makes abnormal noise, there is leakage.

Note: if the leak detector is not used for a long time, please take out the battery.



2. Repair procedures

2.1 Instructions on repair.

- Must turn off the A/C system before turning off the engine.
- Never operate A/C when turning off the high pressure shut off valve of compressor.
- Must stay away from any rotating and moving parts when A/C is working.
- Make sure that the hoses and wires are in good condition. Never be too close to the heat source or contact the belt and pulley.
- When operating with refrigerant, be sure to wear goggles or safety glasses. The liquid of refrigerant and the electrolyte of battery may cause permanent damage to eyes.
- Make sure there is no open fire or electrical short circuit.
- Ensure that all installation standard parts are fastened and of appropriate length.
- Be very careful when installing hose or harness, because sharp objects may cut the hose.
- Dispose of refrigerant in an open and ventilated place.
- Do not touch the O-ring with gloves, in order to prevent the fabric fiber from sticking.
- Before connecting the pipeline, check whether the O-ring is correct, intact and clean.
- When connecting hoses or pipes, drop a little compressor oil into the O-ring to prevent refrigerant leakage.
- When removing the O-ring from the pipe, use a wooden or nylon awl to prevent damage to the pipe.
- When tightening or loosening the bolts, use two spanners to prevent the pipe from twisting.
- Use the correct refrigerant (R134a)
- Use correct compressor refrigerant oil (such as ZXL-100PG refrigerant oil for dks-32 compressor,

BSE55 refrigerant oil for BOCK & BITZER compressor).

- After maintenance, all parts (such as cover, pipeline, fan, harness, etc.) shall be installed and fixed reliably according to the original state.

2.2 V shape belt tension inspection.

If the V-belt is too loose, it will cause belt slip, reduce power transmission and cause damage to the belt. The compressor and generator belts should be checked regularly. Refer to the following table when checking the belt tension.

| Belt type | New belt | During repairing | Tension |
|-----------|------------------------|------------------------|---------|
| A | 392—588N (40—60Kgf) | 294—392N (30—40Kgf) | 8—10mm |
| B | 490—686N (50—70Kgf) | 343—441N (35—45Kgf) | 8—10mm |

2.3 Inspection of refrigerant volume

Start the air conditioner and set the temperature to the lowest. Open the return air grille and observe the liquid sight glass from the return air inlet. If the liquid level is clear, there is no bubble or bubbles are occasionally seen within 45 seconds, it indicates that the refrigerant is sufficient; if there are a large number of bubbles, it indicates that there is a lack of refrigerant, and the refrigerant needs to be supplemented.

2.4 Inspection of compressor lubricating oil volume.

Compressor lubricating oil is used to lubricate the moving parts and sealing elements of the compressor. If the lubricating oil is insufficient, the compressor will not work normally or even be damaged. If there is too much lubricating oil, the cooling capacity will decrease, liquid hammer and other phenomena will occur.

Increase the idle speed to the normal operating speed. After the compressor runs for about 15 minutes, check the lubricating oil: the oil level should be 1 / 4 to 3 / 4 of the height of the mirror. Since the installation position of the compressor may be inclined, it is best to check the oil level through two mirrors.

2.5 Clean the return air grille.

Open the return air grille at the top of the vehicle, remove the return air grille dust screen, check the cleanliness of the dust screen, and clean the dust screen with compressed air when necessary. If the dust screen is dirty or blocked, please wash it in warm water mixed with neutral detergent, rinse it with clean water and dry it completely.

2.6 Clean the condenser and evaporator.

2.6.1 Steps of condenser cleaning.

- ① Remove the condensing fans or protect them with plastic cloth;
- ② Flush the fins with high-pressure water. Pay attention to control the pressure and do not damage the radiator. If the blockage is serious, it is necessary to scrape off the oil stain first, and then add neutral detergent for cleaning.
- ③ Clean the dirt in the condenser.

2.6.2 Steps of evaporator cleaning.

- ① Remove the evaporation blowers or protect them with plastic cloth;
- ② Protect the electric control box and air return port with plastic cloth to prevent water from entering the carriage; Other methods are the same as those for cleaning the condenser.

2.7 Leak inspection

2.7.1 Leak inspection by soap water.

Connect the manifold pressure gauge with the air conditioning system according to the requirements, connect the middle hose of the manifold pressure gauge with the nitrogen cylinders and fill in dry nitrogen slowly to make the pressure of the air conditioning system reach 1.0 MP. Spread the suds evenly on all joints. If bubbles appear on the joints, it means leakage here. Make a mark at the leakage place of the joint and then detect the next joint. After detecting all the joints (please do not miss anyone), the low-pressure gauge of the manifold pressure gauge can be dismantled from the system if no leakage is found. Then increase the amount of nitrogen at the high pressure terminal, make the pressure of the system reach 2.5 MP, and then check the leakage with suds, repeating the above work.

2.7.2 Leak inspection by instrument

There are many leak detection instruments, such as halogen leak detection lamp, halogen electronic leak detector, helium leak detector, etc. now halogen electronic leak detector is commonly used. When in use, first fill a small amount of R134a gas into the air conditioning system with the manifold pressure gauge, turn on the leak detector, place the probe of the leak detector around the detection part and move it slowly. If the leak detector emits a short alarm sound, it indicates that there is a leak, mark the place, and then check the next joint. Check carefully and do not omit. If the leakage is still not found, increase the amount of R134a filled into the system, or fill a certain amount of nitrogen into the system to increase the pressure in the system; then check with a leak detector again.

2.8 Vacuumizing

1. Connect the air conditioning system and the vacuum pump with a manifold pressure gauge.
2. Operate the high and low pressure shut-off valve of the compressor to make the maintenance interface in the usable position; Open the high and low pressure hand valve of manifold pressure gauge; Turn on the vacuum pump.
3. After 30 minutes, the vacuum pumping can be stopped when the vacuum pressure on the vacuum gauge is 98kpa.
4. Close the high and low pressure hand valve and stay for 5min, and the pressure drop shall not exceed 3.4kpa. If this value is exceeded, it indicates that there is a leakage point in the air conditioning system. A small amount of refrigerant can be injected from the low-pressure end. Stop charging when the pressure reaches 49kpa. Check the leakage point with soap water and eliminate the leakage point.
5. Continue vacuumizing the air conditioning system for about 60min. At the end of vacuumizing, close the high and low pressure hand valve first, and then close the vacuum pump.

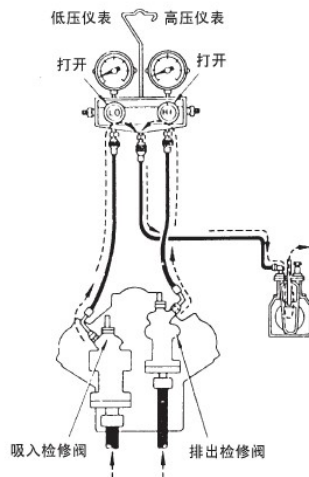


Figure 6.1: vacuumizing

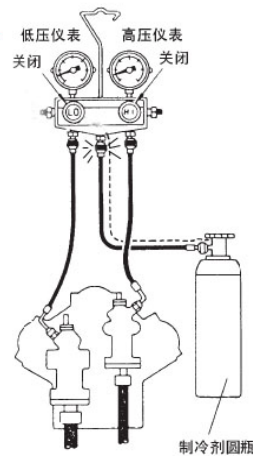


Figure 6.2 Exhaust the air before charging

2.9 Charging from high pressure side

2.9.1 After the system is vacuumized, close the high and low pressure hand valve on the manifold pressure gauge. Do the system leakage detection, and make sure there is no leakage in the system.

2.9.2 Connect the hose in the middle of the manifold pressure gauge with the connector of the refrigerant tank injection valve, loosen the nut at the connection between the hose and the manifold pressure gauge, slowly open the injection valve on the refrigerant tank, let the refrigerant drive away the air in the charging system, and tighten the nut.

2.9.3 Open the injection valve, place the refrigerant tank upside down on the weighing equipment, and record the overall weight of the refrigerant tank.

2.9.4 Open the manual valve on the high-pressure side of the manifold pressure gauge to allow the refrigerant to be charged into the refrigeration system from the high-pressure side. When the charging amount required by the system is reached, close the manual valve on the high-pressure side of the manifold pressure gauge.

2.9.5 Place the refrigerant tank normally, close the injection valve on the tank, slowly loosen the nut at the connection between the hose and the injection valve, discharge the refrigerant in the hose and remove the hose.

2.9.6 If the refrigerant in the tank cannot reach the charging amount of the system, repeat the above steps to continue charging, or charge gaseous refrigerant from the low-pressure side instead.

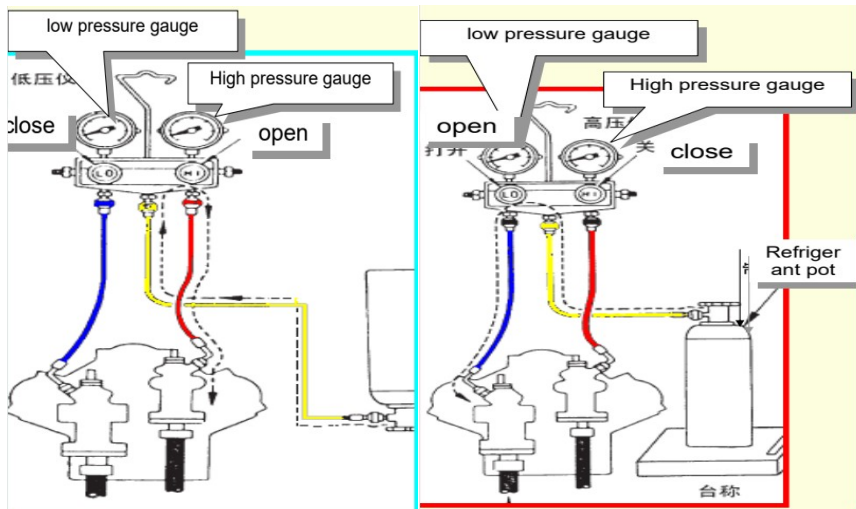


Figure 6.3 Charging from HP side Figure 6.4 Charging from LP side

2.10 Charging from low pressure side

Connect the manifold pressure gauge with compressor and refrigerant tank, open the hand valves of HP and LP of the manifold pressure gauge.

2.10.1 Loosen the nut at the connection between the high and low pressure hose and the compressor, slowly loosen the injection valve on the refrigerant tank, discharge the air in the charging system, tighten the nut of the connecting hose, and close the high-pressure manual valve of the manifold pressure gauge. Record the overall weight of the refrigerant tank.

2.10.2 Use a suitable solid wrench to rotate the valve rod of the high and low pressure stop valve of the compressor clockwise for 1 ~ 2 turns, start the air conditioner and fill the gaseous refrigerant from the low pressure side of the compressor.

2.10.3 After reaching the refrigerant required by the system, rotate the valve rod of the low-pressure stop valve of the compressor counterclockwise, close the stop valve and close the compressor. Close the filling valve on the refrigerant tank.

2.10.4 Slowly loosen the nut connecting the hose, discharge the refrigerant in the hose, and remove the manifold pressure gauge.

2.10.5 If the amount of charge required by the system is not up to date, repeat the above steps and continue filling.

3 Fault diagnosis

When fault happens in the air conditioner, repair it according to the fault code on the control panel and fault phenomenon.

3.1 Fault analysis and treatment of cooling system.

| Items | Reasons to the fault | Troubleshooting |
|----------------------------|--|---|
| Evaporator blowers failure | No power supply | Check alternator |
| | Control panel broken | Replace the control panel |
| | Fuse burnout | Find out the cause and replace the fuse |
| | Relay damaged | Replace the relay |
| | Control wire harness connection failure | Connect the wire harness |
| | Blower broken or speed regulator resistor/ module broken | Replace the blower or speed regulating resistor |
| Condenser fans failure | No power supply | Check alternator |
| | Control panel broken | Replace the control panel |
| | Fuse burnout | Find out the cause and replace the fuse |
| | Relay damaged | Replace the relay |
| | Control wire harness connection failure | Connect the wire harness |
| | Fan broken or speed regulator resistor/ module broken | Replace the blower or speed regulating resistor |
| Compressor | No power supply | Check alternator |
| | Control panel broken | Replace the control panel |
| | Fuse burnout | Find out the cause and replace the fuse |

| | | |
|-----------------------|---|---|
| | Relay damaged | Replace the relay |
| | The wire of the control clutch is not connected properly | Connect the wire properly |
| | Clutch is broken | Replace the clutch |
| | Compressor is broken | Replace the compressor |
| Control panel failure | Vehicle fails to supply power | Examine the power supply wire |
| | The 5A fuse in the A/C ECU burnout | Find out the cause and replace the fuse |
| | Control panel broken | Replace the control panel |
| | The power line of the control panel is not connected properly | Examine and repair |

3.2 Analysis and treatment of pressure fault.

When error code Er04 appears, firstly use pressure gauge, refer to the “Comparison table of pressure and ambient temperature” to judge if the system pressure is abnormal. If abnormal, please refer to the “List of refrigeration failure (pressure)” to handle, otherwise please examine the electrical control system.

3.2.1 Comparison table of pressure and ambient temperature

| Ambient temperature (°C) | High pressure (Mpa) | Low pressure (Mpa) |
|--------------------------|---------------------|--------------------|
| 15.5 | 0.84—1.19 | 0.1—0.15 |
| 21.1 | 1.05—1.75 | 0.1—0.15 |
| 26.5 | 1.26—1.93 | 0.1—0.15 |
| 32.2 | 1.40—2.30 | 0.15—0.2 |
| 37.7 | 1.61—2.30 | 0.2—0.25 |
| 43.3 | 1.89—2.53 | 0.22—0.3 |

Note: Set A/C temperature to lowest, and after A/C starts up and getting stable, and the engine speed is 1800rpm.

3.2.2 List of refrigeration failure (pressure)

| Fault phenomenon | Other phenomenon | Analysis | Trouble shooting |
|---|--|--|---|
| LP is much higher than HP, and HP is higher than usual. | No cooling, LP pipe gets hot | Condenser fans failure, condenser tube or fin clogged/blocked. | Examine the electric system or clean the condenser |
| Both HV and LV is lower than normal | Insufficient evaporator air flow | Evaporator blowers failure, evaporator tube or fin clogged/blocked | Examine the electric system or clean the evaporator |
| HP lower than normal, LP higher than normal | Insufficient cooling capacity | Compressor fault | Replace compressor |
| LP value is zero or even lower, but HP is higher than normal. | Almost no cooling, there is dew or frost before and after expansion valve. | Expansion valve broken | Replace the expansion valve |
| Both HP and LP is higher than normal. | The air suction pipe surface of compressor is colder than normal, and it gets humid or dew | Temperature bulb is not properly installed | Install the sensor bulb properly. |
| HP higher than normal, LP lower than normal | Dew or defrost on the capillary tube (after expansion valve) surface | Expansion valve clogged or broken | Dredge the expansion valve or replace the old one. |



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| | | | |
|---|--|---|---|
| HP & LP is lower than normal | Bubbles can be seen in sight glass, HP pipe warm, LV pipe a bit cool, the different is not big. | System leakage, insufficient refrigerant | Repair the system and supplement refrigerant |
| HP & LP is much lower than normal | Can't see refrigerant flow in the sight glass, almost no temperature gap between HP and LP pipes | Severe leakage in system, almost no refrigerant left. | Repair the system and supplement refrigerant |
| HP is higher than normal, LP reaches zero or below zero, and pressure gauge shakes irregularly. | Air in the vehicle is sometimes cold and sometimes hot | Too much water in the system. The moisture absorption of the drying filter is saturated, causing the moisture to freeze and block the expansion valve | Replace the filter drier, vacuum the system again and charge refrigerant. |
| Both HP & LP is higher than normal, and pressure meter pointer swings obviously. | Insufficient cooling, bubbles in sight glass occasionally. | Air is mixed inside system | Replace the filter drier, vacuum the system again and charge refrigerant. |
| HP & LP pressure higher than normal | Insufficient cooling | Too much refrigerant is charged, and compressor oil over charged | Release some refrigerant or compressor oil. |

---The end---

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