Use Notice：

1. This user’s manual mainly introduce the working principle, system composition, operation, system installation, debugging, daily maintenance and troubleshooting of the air conditioning system of construction vehicle.
2. Please carefully read through this product manual before using it. If not following instructions and notices in this manual, your operation may damage the air conditioning system, influent the performance and lifespan of the air conditioning system and cause any property loss.
3. This product should be installed by professionals. If there are problems that cannot be solved during its working time, you should stop the system immediately, and connect Xu Zhou Tian Yi Technology CO.,LTD, you will have your problems solved perfectly.
4. Machine needs maintenance, precision instrument especially needs your attention. Therefore, please be attention not to let dirt (cement, sand clay etc.)enter into the system, not to put things before return air inlet to keep return air smooth, and not to remove the main parts of the system privately.

CONTENTS

1 General Introduction

Air conditioning system of TY serious construction vehicle consists of evaporator, condenser, compressor, piping and control system. The compressor is driven by the vehicle engine, independent motor and hydraulic motor, and the vehicle provides power to the air conditioner. TY air condition system can satisfy the use in various vehicle cabs including construction vehicle cab, truck cab, special vehicle cab at the airport, and bus cabs.

2 Technical Parameters

Cooling capacity: 3800~4600W

Refrigerant oil: PAG100

Flow: 450m³/h

Compressor: 5H14

Voltage:24V or 12V

Axle power consumption: ≤2000W

Refrigerant: R134a

Heating capacity: 5000W（Optional）

Total power consumption: ≤500W（including condenser fan）/300W（excluding condenser fan）

3 System composition:

TY serial engineering air-conditioner is composed of the compressor, condenser, dehydrator and evaporator. The system composition is shown as Figure 1:

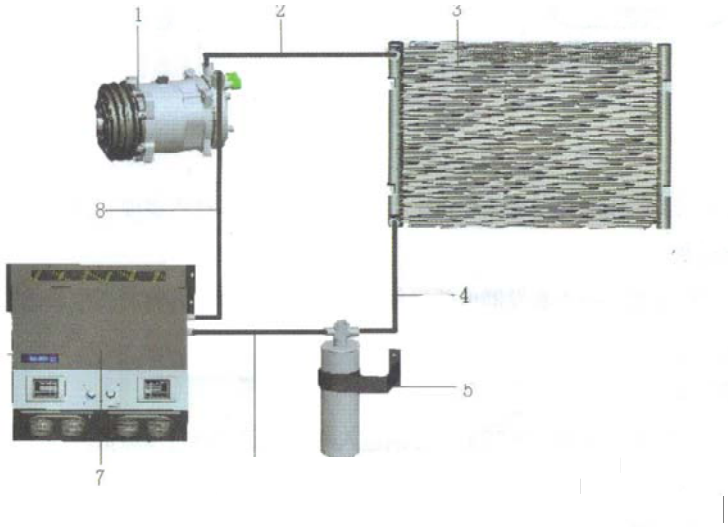

Figure 1: Air conditioning system illustration

1. Compressor
2. Rubber tube of compressor-condenser
3. Condenser Assembly
4. Rubber tube assembly of compressor- dehydrator
5. Reservoir Assembly
6. Rubber tube assembly of dehydrator-evaporator
7. Evaporator assembly
8. Rubber tube assembly of evaporator-compressor

4 Working Principle

4.1 Cooling system

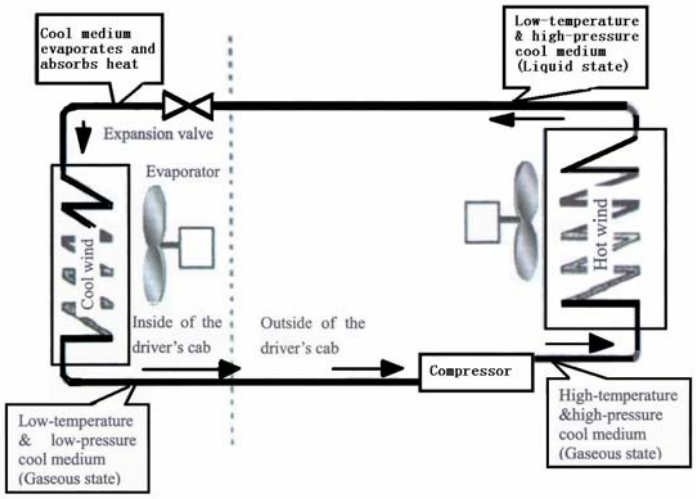

Figure 2: Cooling circulation system

This system adopts vapor compression cooling system consisting of four main work processes.

A. Compression

During operation, the compressor sucks in low temperature and low pressure refrigerant in the evaporator and discharge it into condenser after being compressed into high temperature and high pressure refrigerant.

B. Condensation

After entering into the condenser of the refrigerant gas at high temperature and high pressure from the compressor, it performs heat sink to change gradually into liquid refrigerant at high temperature and high pressure.

C. Throttling expansion

After being dried and filtered by dehydrator, the liquid refrigerant at high temperature and pressure is sent to the expansion valve. After passing the throttling expansion valve, its pressure and temperature are sharply lowered. It enters the evaporator in form of mist drip.

D. Evaporation

After the mist refrigerant with boiling much lower than the temperature inside the evaporator absorbs heat and vaporizes, it changes into gas at low temperature and low pressure to enter the compressor for next circulation.

4.2 Heating system(Optional)

Using hot water, the heating system of the air conditioning system takes cooling circulation water of the engine or independent fuel oil heater as heat source.

4.3 System automatic protection

A. Pressure control

Pressure of the system is controlled by the high/low switch, and the pressure ranges 0.196MPa-3.14MPa during normal operation. In case of over high or low pressure, the high/low switch automatically disconnects. The compressor stops running for protection of the system.

B. Temperature protection

When the temperature of working medium in the dehydrator reaches 102-110℃, the fusible plug of the dehydrator will be melt. The working medium in the system emits to the air for protecting the system.

5 Operation

5.1 Mechanical air conditioning controller

The mechanical air conditioning controller is frequently used on cooling only air conditioner. When it is used on cooling& heating air conditioner, it realizes heating function control working in with manual water valve or electric water valve.

5.1.1 TY mechanical air conditioning controller(Example One)

(1) Introduction of panel (Refer to Figure 3)

Figure 3

1. Flow and power switch 2. Working indicator 3.Temperature control switch

(2) Operating steps of air conditioner cooling

1) Start engine of the main unit.
2) Turn on flow and power switch on the control panel to the comfortable air speed (There are three levels of air speed: H/High, M/Middle, L/Low).
3) Turn on the temperature control switch (The indicator lights). O position means that cooling function of the air conditioner is in off state. Turn the temperature control switch clockwise to enlarge cooling capacity in turn. COOL position means the large cooling capacity state.

Note: To fast lower the temperature of cab, generally turn the flow switch to the highest air speed when starting the air conditioner, meaning to turn the temperature control switch to the largest cooling capacity state (COOL position). When the temperature of cab gets comfortable, adjust the flow switch for comfortable air speed, and adjust the temperature control switch to your comfort.

(3) Operating steps of air conditioner heating(Optional):

The cooling & heating air conditioning system with mechanical air conditioning controller performs heating by taking heat of cooling water of the engine as heat source, and is controlled by manual hot water valve. The operating steps are as below:

1) Start engine of the main unit. Open the hot water valve of the air conditioner heating system.
2) Turn on flow and power switch on the control panel to the comfortable air speed.

5.1.2 TY mechanical air conditioning controller(Example Two)

(1) Introduction of panel (Refer to Figure 4)

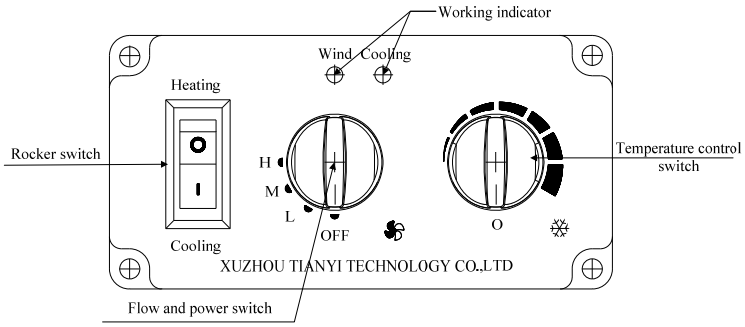

Figure 4

(2) Operating steps of air conditioning cooling

1) Start engine of the main unit.

2) Press rocker switch to cooling mode, turn on flow and power switch on the control panel to comfortable air speed (There are three levels of air speed: H/High, M/Middle, L/Low).

3) Turn on the temperature control switch (The indicator lights). Turn the temperature control switch clockwise to enlarge cooling capacity in turn.

Note: To fast lower the temperature of cab, generally turn the flow switch to the highest air speed when starting the air conditioner, meaning to turn the temperature control switch to the largest cooling capacity state. When the temperature of cab gets comfortable, adjust the flow switch for comfortable air speed, and adjust the temperature control switch until the indicator goes out.

(3) Operating steps of air conditioning heating

1) Start engine of the main unit.

2) Press rocker switch to heating mode, turn on flow and power switch on the control panel to the comfortable air speed (There are three levels of air speed: H/High, M/Middle, L/Low).

Under this circumstance, the temperature control switch will not work.

5.1.3 TY mechanical air conditioning controller(Example Three)

(1) Introduction of panel. (Refer to Figure 5)

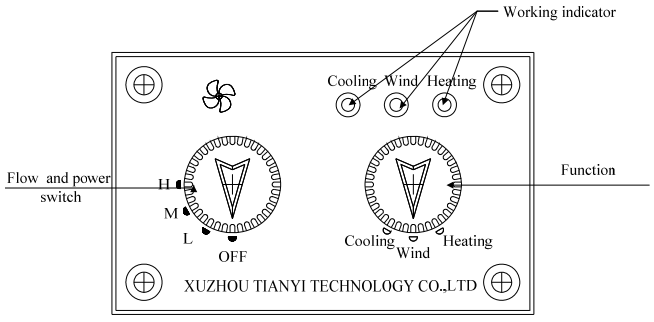

Figure 5

(2) Operating steps of air conditioning cooling

1) Start engine of the main unit.

2) Press function switch to cooling mode, and the corresponding light will be on.

3) Turn on the flow and power switch to comfortable air speed. (There are three levels of air speed: H/High, M/Middle, L/Low).

Note: To fast lower the temperature of cab, generally turn the flow switch to the highest air speed when starting the air conditioner, When the temperature of cab gets comfortable, adjust the flow switch for comfortable air speed.

(3) Operating steps of air conditioning heating

Refer to the operating steps of air conditioning cooling.

5.2 Digital display air conditioning controller

（1） Introduction of panel（Refer to Figure 6）

This air conditioning controller is equipped with two working modes including cooling and heating, operator sets working temperature and controller adjust it itself.

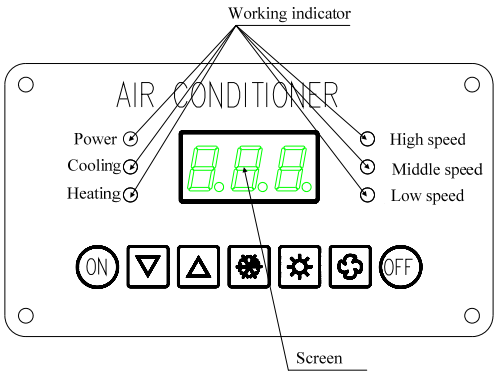

Figure 6

ON OFF：Panel switch，Press ON to power on the air conditioner ,and the power indicator lights ； press OFF to disconnect power, and the power indicator turns off。

▽ △：Adjust and set temperature，Press ▽ once to set the temperature one degree lower: press △ once to set one degree higher.

：Cooling key: After press ，the cooling indicator lights, and the system performs cooling.

：Heating key: After press ，the heating system indicator lights, and the system performs heating.

：Air speed adjusting: When powering the air conditioning on, the initial air speed of the fan is low. Continuously press for air speed circulation in turn of Low-Middle-High-Low, and the corresponding indicator lights.

（2） Operation

(1) Start the engine of the main unit

(2) After pressing ON key, the power indictor lights.

(3) After pressing key, the fan indicator lights. Continuously press for air speed circulation in turn of Low/Middle/High, and the corresponding indicator lights.

(4) After pressing (or) the corresponding cooling(or heating) working indicator lights, and the air conditioner begins cooling (or heating).

(5) The air conditioner automatically sets the temperature to 20℃. Press ▽ or △ to set desired temperature.

(6) Press OFF key to disconnect power supply and all output.

（3） System fault automatic diagnosis

In case of fault with the air conditioning system, the display flashes to show the followings:

(A) ER1-Press switch disconnects during cooling.

(B) ER2-Short-circuit of any sensor

(C) ER3-Open-circuit of any sensor

（4） System operation automatic control

a) In case of temperature≤1.5℃ of the set temperature, the system automatically stops cooling (or starts heating)

b) In case of temperature≥1.5℃ of the set temperature, the system starts cooling (or stops heating).

c) When the temperature of defrosting temperature sensor in the evaporator is lower than 2.5℃, the compressor automatically stops, and cooling is in pause; when the temperature of defrosting temperature sensor in the evaporator is higher than 4.5℃, the compressor automatically starts, and cooling is started.

5.3 LCD air conditioning controller

5.3.1 LCD Air conditioning controller

(1) Introduction of the panel（Refer to Figure 7）

TY air conditioning controller is equipped with three working modes including cooling, heating and ventilation, and fresh air, core defrosting function as well.

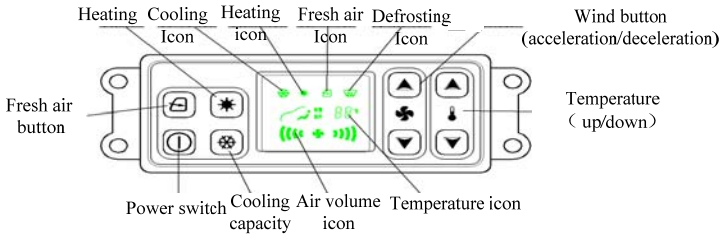

Figure 7

◆ Power switch:

After pressing the power switch to turn the power on, the back lamp of the LCD lights , the fan run at low speed for 3 seconds (During this time, the controller will not accept any operation), and the controller memorizes the state of last time turn-off. Press the power switch again to disconnect the power, and the back light lamp turns off.(Note: After turn on the switch, whatever the state of warm valve and air door are, controller will turn off warm valve first, air door performs internal circulation)

◆ Cooling key:

After pressing the cooling key, the system enters cooling mode, and the display shows the cooling icon and set temperature and air speed of last time of cooling. If the cooling icon blinks, which means system has a problem of pressure, operator should stop air conditioning system and maintain it.

◆ Heating key:

After pressing the heating key, the system enters heating mode, and the display shows the heating icon and set temperature and air speed of last time of heating.

◆ Defrosting key:

After pressing the defrosting key, the system enters core defrosting mode, and the display shows the defrosting icon.

◆ Fresh air key:

In cooling/heating mode, after pressing fresh air key on the panel, the fresh air icon on the display lights, and the system enters external circulation mode to change the air in the cab with fresh air. After pressing this key again, the external circulation icon on the display disappears, the internal circulation icon lights, and the air in the cab performs internal circulation.

◆ Temperature up / down key:

In the mode of set temperature displayed, after pressing temperature up (or down)key, the set temperature is one degree up (or down).

◆ Air speed up/down key:

There are three levels of air speed: L(Low).M(Middle) and H(High). Press the air speed up(or down) key for air speed circulation in turn of L(Low).M(Middle) and H(High).

(2) Operation of TY LCD air conditioning controller

1) Start the engine of the main unit

2) After pressing the power switch of the air conditioner to power on, the back light lamp of the LCD lights, and the display shows the icon before last time turn-off.

3) The operator sets the desired working mode of the air conditioning system according to actual need.

4) Press the air speed setting key to adjust the air speed desired.

5) Press temperature setting key to preset the temperature.(In cooling mode, when indoor temperature is 3℃ lower than the preset temperature, the system will automatically stop cooling; when the temperature in the cab is 3℃ higher than the preset temperature, the system will automatically start cooling.)

5.3.2 Intelligent air conditioning controller

(1) Introduction of the panel(Refer to Figure 8)

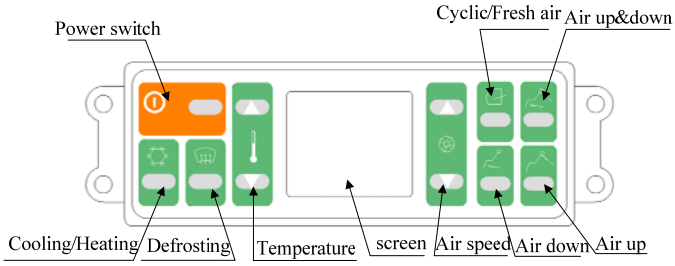

Figure 8

Power switch	After the installation of the controller, the connection of electricity and main power system and motor is in working status, press the key to switch over the on/off state of controller. Buzzer sound and effective。
Cooling	To enter Cooling(Heating) mode from Heating(Cooling)mode Under normal working conditions, press the key to enter cooling mode. Buzzer sound and effective.
Defrosting	To make the air conditioning system blow the vehicle's window. Under normal working conditions, press the key to enter vehicle window defrosting mode. Buzzer sound and effective.
Cyclic/Fresh air	To switch from Cyclic air mode to Fresh air mode. Under normal working conditions, press the key to switch from one mode to another. Buzzer sound and effective.
Air up	To air up Under normal working conditions, press to key to make the air conditioning system to blow air up. Buzzer sound and effective.
Air down	To air down Under normal working conditions, press to key to make the air conditioning system to blow air down. Buzzer sound and effective.

Air up & down 	To air up & down Under normal working conditions, press the key to blow air up and down at the same time. Buzzer sound and effective.
Temperature 	To set temperature. Under normal working conditions, the controller can set temperature between 15 ℃ to 30 ℃， press the key to set temperature up or down. Buzzer sound and effective.
Air speed 	To adjust air speed. Under normal working conditions, press the key to adjust air speed to comfortable air speed. Buzzer sound and effective.

(2) Operation

1) Start the engine of the main unit.
2) Press ON/OFF key to turn on the controller.
3) Press corresponding key to select the desired air conditioning operation mode.
4) Press the air speed key to select the desired air speed.
5) Press the temperature key to set temperature.
6) Press air condition key to select the air conditioner air blowing direction (Generally select cooling air up, heating air down mo de).

6 Installation

Attention:

A. Installation is required to be performed by qualified personnel.

B. Read carefully through the users' manual before installation.

C. The components must be free of damage and properly sealed. The inner part of the components must be dry and clean.

D. The working environment must be clean and damp-proofing. It must prevent dirt and moisture from entering into the loop.

6.1 Compressor installation

a) Clutch belt sheave of the compressor must be place at same level of the engine belt sheave.

b) Tension device is required for the compressor belt. The tension is recommended to fall 10-12mm when 98N force is given to the belt.

c) Compressor interface must be upward with a 45° axial rotation angle.

d) The maximum gap between the compressor feet with fixation feet of the bracket is 0.1mm.

6.2 Evaporator installation

a) Handle with care to avoid damage against the finish.

b) Install the evaporator at the main unit preserved position making the fixation hole, drain pipe align with the corresponding preserved holes, and make secure installation.

c) Air inlet and outlet of the evaporator should be free of obstruct for expected flow, cooling and heating effect.

6.3 Condenser installation

a) Good ventilation for the condenser is required.

b) Generally, the air inlet connector(large pipe)of the condenser should be at upper position and the drain pipe (thin pipe) at lower position.

c) Secure installation is required. There should be free of damage against the blade and fan. Reliable power cord connection is required.

Note: Do not screw off the connector cap for fixing the condenser to prevent dust from entering the condenser causing bad effect to the air conditioning system.

6.4 Dehydrator installation

Dehydrator must be vertically installed at the place with good ventilation. Immediately connect the pipeline after opening the end cap of the dehydrator to avoid desiccant nullification due to long term exposure to air.

Attention: Make correct connection of the inlet and outlet of the dehydrator. Connect the drain pipe of the condenser with the inlet of the dehydrator. Wrong connection is prohibited.

6.5 Cooling piping installation

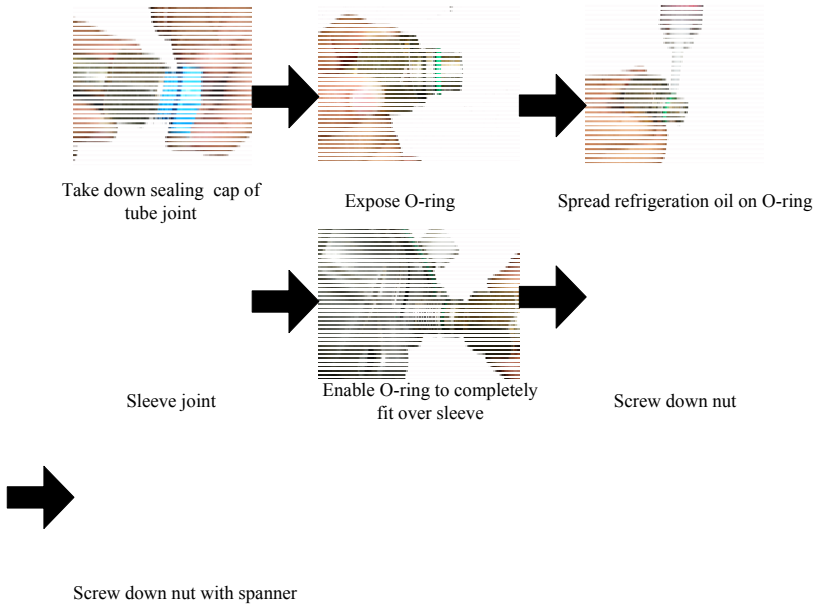

Figure 9: Piping connecting steps

a) Connect the cooling pipe according to the operating steps shown in Figure 9. Refrigeration oil is required to be applied on piping connector and O ring. Pour the refrigerant oil left in the bottle into the low pressure port of the compressor (Large pipe).

b) During connecting the pipe, make sure the seal ring on the pipe connector thoroughly in the pipe connector. Meanwhile, improper location of the seal ring should be avoided. Firstly screw down the nut manually, and then tighten it with wrench. It can not be forced to screw down if the nut can not be screw down smoothly or the nut is not properly placed.

c) Tightening torque

3/4 screw thread	16-18 Nm
7/8 screw thread	16-28 Nm
9/16 screw thread	15-18Nm

d) Thread locker can be applied on the screw thread if necessary (Thread locker is not allowed to enter into piping system.).

1. Caution: Piping should be possibly kept away from heat source and sharp articles.
2. Minimum bending radius of the piping is 90mm, and it should be free of twisting.
3. Clamps are required for the piping to be against vibration and abrasion.

6.6 Electrical connection

a) Prescribed voltage is required for the air conditioner.

b) The space between cords should be free of heat source and sharp articles.

c) Reliable connection for plug-in is required.

7 Debugging

After completion of system installation or maintenance, system debugging is required (Qualified personnel are required to perform the debugging).

Attention:

A. Working environment should be clean and damp-proofing to prevent dirt and moisture from entering into the system.

Keep work done away from rainy day as possible.

B. R134a refrigerant is required. R12 and other refrigerants are strictly prohibited.

7.1 Vacuum treatment:

Vacuum treatment is for removing moisture and air in the system. It is a critical procedure for air conditioner installation or maintenance. The frequently used tools for vacuum treatment include manifold pressure gauge (Refer to Figure 10) and vacuum pump.

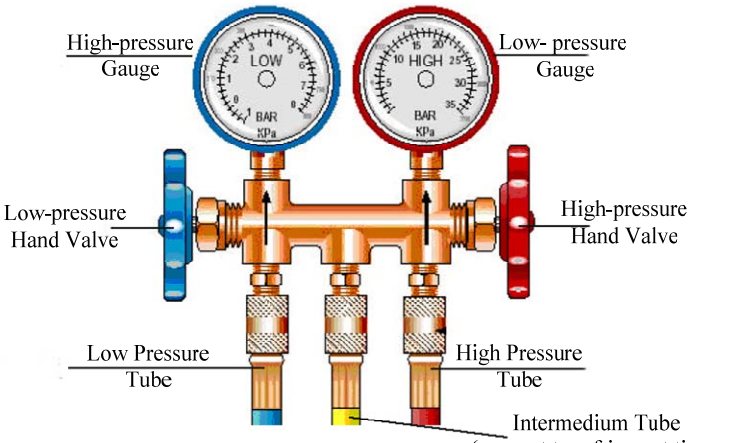

Figure 10

7.1.1 Connect the high pressure and low pressure hose of the manifold pressure gauge respectively with the high pressure and low pressure filling entrance of the air conditioning system, and make sure that the high pressure and low pressure manual valve of the manifold pressure gauge is in close state.

7.1.2 Connect the middle hose of the manifold pressure gauge with the air inlet of the vacuum pump (Refer to Figure 11 for connection).

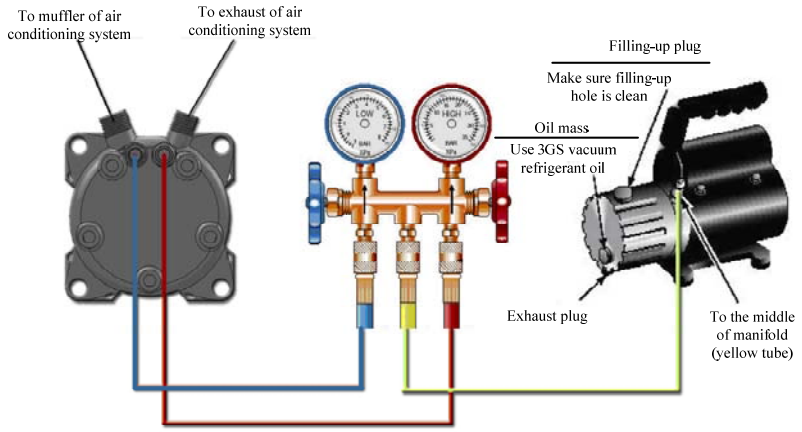

Figure 11

7.1.3 Open the manual high and low pressure valve of the manifold pressure gauge, start the vacuum pump and pay attention to the low pressure gauges to achieve the system pressure vacuum of -0.1MPa.

7.1.4 Close the manual high and low pressure valve of the manifold pressure gauge, close the vacuum pump, check system pressure after keeping the pressure for 30min. The rise of system pressure means leakage of the system. Leakage detection and maintenance are required. If the system pressure keeps at -0.1MPa, meaning the pointer of the pressure gauge keeps still or almost still, it is to open the manual high and low pressure valve, start the vacuum pump for going on vacuum treatment for 15~30min making the vacuum pressure gauge pointer stable.

7.1.5 Close the manual high and low pressure valve of the manifold pressure gauge.

7.1.6 Close the vacuum pump.

Note: 1.Close the manual high and low pressure valve of the manifold pressure gauge before closing the vacuum pump to prevent air

from entering the system.

2.Time for vacuum treatment must meet the requirement for a through elimination of moisture inside the system. In case of humid weather, repeated vacuum treatment is required.

7.2 Leakage detection

Frequently used leakage detection methods of the air conditioning system include detections with pressure, filling in refrigerant, observation, and electronic leakage detector.

The use of electronic leakage detector is as following:

7.2.1 Fill 0.1MPa refrigerant into the system.

7.2.2 Connect power through to the electronic leakage detector and preheat for 10min, make sure device is working.

7.2.3 Push the switch to detection position. Place the probe detected position. In case of leakage volume over the sensibility range, voice alarm will be heard.

7.2.4 When all the leakage positions are found, perform maintenance.

7.2.5 After maintenance, further keeping pressure and leakage detection are required until all the problems of leakage are solved.

7.3 Filling refrigerant:

After vacuum treatment, keeping pressure and leakage detection, filling refrigerant into the system can be performed. There are three methods of filling refrigerant: high pressure filling, low pressure filling and mixed high and low pressure filling. Among them, the mixed high and low pressure filling is faster. Therefore, it is mostly used for installation and debugging. The following is a brief introduction of the mixed high and low pressure filling refrigerant:

7.3.1 It is the same to connect the manifold pressure gauge with the compressor as 7.1.1

7.3.2 Connect middle hose of the manifold pressure gauge with the connector of filling valve of refrigerant tank (Refer to Figure 12).

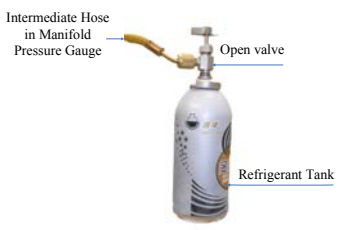

Figure 12

7.3.3 Make sure that the air conditioner is in off state, and the engine is in stop state.

7.3.4 Open refrigerant opening valve, unscrew the exhaust valve of the pressure gauge on the manifold pressure gauge to expel the air with refrigerant from the middle hose for 2-3 秒, and then screw down the exhaust valve.

7.3.5 Screw off the manual high pressure valve of the manifold pressure gauge. Make the refrigerant tank upside down, and fill liquid refrigerant from the high pressure side.

7.3.6 After filling the liquid refrigerant for a certain period from the high pressure side, if the weight of refrigerant tank does not increase or the manifold pressure pointer keeps still, but the refrigerant is not filled at the specified volume, it is to close the high pressure manual valve and erect the refrigerant tank.

7.3.7 Start the engine to keep a rotation speed ranging 1250~1500r/min, turn on the cooling switch of the air conditioner, select the highest level of the flow, and open the low pressure manual valve and to let gas refrigerant enter the system.

7.3.8 During filling the refrigerant. Observe flowing state of the refrigerant through the observation hole of the dehydrator. When there is not air bubble and the liquid is stable, it means proper volume of refrigerant filled (At this time, the system pressure valve displayed by the manifold pressure gauge meets the system pressure parameters as specified in 7.6); sporadic air bubble means insufficient of refrigerant; free of air bubble in the hole and fast flowing liquid means to much refrigerant filled. Insufficient or excessive refrigerant filled into the system will lower the cooling effect of air conditioner.

7.3.9 After completion of filling, it is to close the refrigerant tank, and then close the low pressure manual valve, stop operation of the air conditioner, stop operation of the engine. Wait for 1~3min, quickly remove the two ends of the manifold pressure gauge. It is required to quickly remove the connector to avoid too much leakage of refrigerant. Make secure installation of cap for filling inlet of the system.

7.3.10 In case changing the refrigerant tank during filling, it is to close the manual valve at filling side. After waiting for 1~3min, it is to quickly screw off the opening valve and connect to another tank of refrigerant. After completing the change, repeat the step 7.3.4. Then, go on filling according the state before changing the tank.

Attention:

- **When performing high pressure filling with high manual valve open, it is strictly prohibited to start the compressor to**

avoid hydraulic hit.

- **Wearing gloves for removing the pipe are required to avoid frostbite. Wear on protective glasses if necessary.**

7.4 Supplement refrigerant

7.4.1 Use manifold pressure gauge to supplement refrigerant. The connection is the same as 7.3.1 and 7.3.2.

7.4.2 After connection the pipe, expel the air in the middle hose according to 7.3.4.

7.4.3 Start the engine, turn on the air conditioner, turn the flow the maximum volume, open the low pressure manual valve to let the refrigerant enter the low pressure pipe in form of gas (At this time, the refrigerant tank should be placed upright.) until the system pressure reaches the specified value. (The adjustment method is the same as 7.3.8.)

7.4.4 After filling, close the low pressure manual valve, stop the operation of air conditioner, stop the operation of the engine. After waiting for 1~3min, quickly remove the two connectors of the manifold pressure gauge. It is required to quickly remove the connector to avoid too much leakage of refrigerant. Make secure installation of cap for filling inlet of the system.

Attention:

- **At this time, the refrigerant tank should be placed upright.**
- **The high pressure manual valve should be closed. Opening it is strictly prohibited.**

7.5 Discharge refrigerant

Excessively filling refrigerant into the air conditioner system will lower the cooling effect. Therefore, if excessively refrigerant is found filled into the system (Make judgment following 7.3.8), follow the steps below to discharge the excessive refrigerant:

7.5.1 It is recommended to directly use reclamation equipment for reclaiming the refrigerant. In case of no reclamation equipment available, manifold pressure gauge can be used to discharge the refrigerant.

7.5.2 Connect the high and low pressure hose the manifold pressure gauge respectively with the high and low pressure filling valve, and place the middle hose at bottom of the vehicle.

7.5.3 Open the high and low pressure manual valve. It is recommended to open the valve at low level to observe the readings of the pressure gauge. When meeting the values in the pressure parameter table of the system under different temperature specified in 7.6, it is to close the high and low pressure manual valve.

7.5.4 When the entire refrigerant is required to be discharged for maintaining the air conditioning system, observe the pressure gauge readings until it gets to zero.

Attention: The operator should stand far away from the refrigerant discharge outlet during discharging the refrigerant to avoid frostbite.

7.6 System pressure parameters under different temperatures.

Ambient Temperature	Low-pressure Gauge Value (MPa)	High-pressure Gauge Value (MPa)
	Refrigerant R134a	
21.1℃	0.07~0.15	1.05~1.26
26.6℃	0.102~0.19	1.26~1.48
32.2℃	0.119~0.19	1.44~1.68
35℃	0.147~0.211	1.57~1.75
37.7℃	0.157~0.211	1.62~1.85
40.5℃	0.17~0.24	1.75~2.11
43.3℃	0.18~0.26	1.82~2.32
Condition: Compressor rev of 2000RPM; Maximum air volume; humidity 60%		

8 Maintenance

The lifespan of air conditioner of TY construction vehicle are mainly decided by the correct maintenance of the users.

8.1 Daily maintenance

a) Check and clean the condenser of the air conditioner. Inside of the heat sink, it is required to be clean and free of jam. Cool water or compressed air is required for cleaning, and hot water or hot air is prohibited.

b) Check cooling capacity of the cooling system, meaning to observe the observation window on the dehydrator. It is normal that there is no bubble in the observation window, and there is a small amount of bubble when the engine rotation speed is changed.

c) Check the drive belt tension of the compressor.

d) Check to find if hose appearance is normal and the connectors are reliable.

e) Check to find if power supply of the cooling system is connected secure and if there is poor connection or short circuit or not.

Attention:

- **No matter the air conditioner is being used or idle, it is required to make regular check and maintenance on the piping and other facilities.**
- **If the air conditioner is kept idle for months, it is required to turn the air conditioner on roughly 10 minutes once a month for keeping normal operation of the system.**
- **In case of heating system in winter, Anti-freezing fluid is required for the circulation water for heat source to avoid frost crack caused of the core or pipe.**

8.2 Regular maintenance

Items and frequency for regular maintenance on the air conditioner

Parts of the system		Maintenance	Maintenance frequency		
			Monthly	Half Year	Yearly
Cooling system	Cooling pipe	Check abrasion of the pipe		※	
	Connector	Check leakage (leakage is generally with oil trace)			※
	Condenser	Check the heat sink		※	
	Dehydrator	Check use state or place			※
	Refrigerant	Check the refrigerant state through the observation window	※		
	Main unit of the air condition	Check the fixation and installation of the main unit (It should be free of loose).			※
	System airtight	Check airtight of the vehicle and air conditioner			※
Compressor	Electromagnetic clutch	Check operation of the clutch		※	
	Belt	Check the belt and its tension			※
	Fixation bracket	Check the fixation and installation			※
	Compressor operation	Check if there is abnormal sound during operation	※		
Electrical	Power cord	Check if there is damage on the power cord		※	

9 Troubleshooting

Table of troubleshooting

Failure	Description	Causes	Solution
Interrupted cooling	The cooling system is not normally on or stops	1. Moisture in the system causes jammed expansion valve by ice. 2. The air conditioner is out order.	Change the dehydrator and repeat the vacuum treatment Maintain or change adjustment

		3. Poor connection of grounding wire. 4. Poor contact of the control switch.. 5. Poor contact of the relay	Check and maintain Check and maintain Check and maintain
Increased noise	Abnormal sound is heard from the system	1. Loose belt 2. Loose fixation of the compressor bracket 3. Loose blade of the evaporator fan 4. Slipping clutch 5. Inner abrasion of the compressor	Adjust or change Adjust Adjust Maintain or change Maintain or change
Insufficient heating	No hot air is supplied	1. The hot valve is not opened 2. Blocked piping 3. Low temperature of the heating medium 4. Piping leakage	Open the valve Maintain Open it after the temperature increase Maintain or change
No cooling performed	The evaporator runs normally, but the compressor does not work	1. Compressor clutch a) Coil break or short circuit b) Slipping clutch 2. Poor connection 3. Broken belt 4. Action of the pressure switch a) Leakage of the refrigerant b) Too much refrigerant filled c) Damaged switch 5. Damaged temperature controller	 Change Maintain or change Check and connect Change Leakage detection supplement Proper release Replace the damaged parts Replace the damaged parts
	The evaporator runs normally, the compressor works	1. Leakage of the refrigerant 2. too much refrigerant filled	Leakage detection supplement refrigerant Proper release
	The evaporator fan does not run, the compressor does not work	1. Failure of power cord a) Poor contact of grounding wire b) Burn of fuse c) Damaged power supply switch	 Check and maintain Check and change Check and change
	The evaporator fan does not run, the compressor works.	1. Damaged fan 2. Burn of fuse 3. Damaged flow level switch 4. Damaged adjustable resistance	Change Change Change Change
Poor cooling effect	Normal evaporator fan	1. Loose belt 2. Insufficient refrigerant caused by leakage 3. High pressure is high and low pressure is high a) Dirty and jammed condenser heat sink b) Condenser fan stops c) Too much refrigerant filled d) Air in the system, the pressure gauge	Adjust Leakage detection supplement Clean Maintain or change Proper release Leakage detection release

		jitters	supplement
		e) Over largely opened expansion valve	Adjust or change
		4. High pressure is high, low pressure is low	
		a) Dirty and jammed expansion valve	Clean or change
		b) Dirty and jammed	Change
		c) Jammed high pressure piping	Maintain or change
		5. High pressure is low, low pressure is low	
		a) Insufficient refrigerant caused by leakage	Leakage detection supplement
		b) Over small opened expansion valve	Adjust or change
		c) Jammed low pressure piping	Maintain or change
		d) Jammed operator	Maintain or change
		6. High pressure is low, low pressure is high	
		a) Failure of the compressor	Maintain or change
		7. Opened heating system hot water valve	Maintain or close
	Insufficient flow from the evaporator	1. Jammed inlet and outlet	Remove the obstruct
		2. Jammed air outlet	Remove the obstruct
		3. The evaporator frosts	maintain

10 Service

10.1 Service record

For high quality service to the users, our company will make record on the maintenance for follow-up service and service consultation.

10.2 After-sales service

Before asking for servicing, please make a check following the troubleshooting table. After making sure the failure, contact the distributor or service department of our company.

10.3 Special notes on maintenance

10.3.1 Maintenance service

In case of fail to find a solution by call for the failure and site service is required, please follow the following steps for site service:

A. Information to be offered includes: product No., certificate of conformity No., vehicle No., and purchase date.

B. Air conditioner failure description is required to be offered to customer service personnel of our company

C. Please make a favor to our after-sales personnel with site maintenance.

After receiving the complaint call from the customer, our company will provide the effective solution within one hour and makes the following service response: provide available service within 24 hours if within the distance of 500km; provide available service within 48 hours if over the distance of 500km; the required accessory will be sent out within one working day. Emergency solution is available for emergent cases.

10.3.2 Maintenance

A. For the hardware products sold with the main unit, we provide one year (Counting from the date of vehicle purchasing invoice) free charge of maintenance and parts change for the quality problem caused by non-misuse.

B. The products with no valid warranty are beyond free service, and reasonable travel expense, material charge and labor cost for site maintenance will be charged.

C. One of the following is beyond warranty (Users will undertake the expense if service is asked):

- Failure caused by operation or installation, which fails in following the product manual.
- Failure caused by unauthorized repair, modification, reform or exchange.
- Failure of cable or piping caused by impact of outside force.
- Missing of air conditioner components.
- Air conditioning system damages or other failures caused by vehicle failures.
- Improper maintenance causes severe distortion, and the leakage caused by impact.
- Unauthorized refrigerant filling or release.
- Water leakage of hot air system in winter caused by improper maintenance.
- Damages caused by other force major (e.g. earthquake, flood, etc.)