

Operating Instruction of Electric Fence

- Please read the instruction carefully before use.
- The instruction is applicable to electric fence host series products.
- The instruction contains service guide, please be sure to keep it well.



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Chapter 1 Introduction of Product

1.1 Design basis of product

GB/T7946-2008 Electrical installation and safe operation of electric security fences

JB/T5163-2007 Machinery Industry Standard of People's Republic of China

1.2 Characteristics of product

Electric fence system is to set electric fence detectors in the area around non access channels to form an electric fence for prevention and management. When someone tries to contact electric fence, he will be repelled by high voltage pulse of electric fence. If someone damages or intrudes, when the detector detects the electric fence is damaged or someone is climbing, it will cause short-circuit, grounding or open circuit of the electric fence, the detector will release alarm signal and transmit it to the management center by alarm circuit. The security staff can lock the illegal climbing position very quickly by electronic map. At the same time it pops-up the screen of the correspondent camera on the monitor by video linkage, so that the security staff of management center can observe the situation on spot. Compared with other perimeter security products, it has following advantages:

Comparison between intellectual perimeter security blocking alarm system and other perimeter security products

Function	Infrared	Tension network	High voltage grid	Intellectual perimeter security blocking alarm system
Deterrent	No	slightly	Yes	Yes
Blocking effect	No	Yes	Yes (large striking force which can make people hurt)	Yes (will give electric shock to people but do no harm to human body)
Alarm	Yes	Yes	Yes	Yes
False alarm rate	High	A certain false alarm rate	No	Low
Installation and debug	Easy to install	Difficult to install and debug	General	Easy to install
Reliability	Low	Lower	Higher	High
Direct cost	Low (simple terrain) High (complicated terrain)	Very high	Very high	Little higher
Comprehensive cost	High	High	High	Low (low cost of maintenance, installation and use and long service life)

Our host adopts the most advanced technic solution and the product design is more reasonable. Compared with the traditional electric fence products, it has realized technologically revolutionary breakthrough and is also currently the most advanced electric fence product in the country. The host has extraordinary advantages which are:

- The first pulse host of color display of host working status in the industry. The LCD display is simple, pretty, complete and clear;
- The LCD displays the working status of host: pulse form display, system real-time clock display, pulse period, pulse amplitude, host power supply state, host internal real-time temperature display, alarm status display, etc. very convenient for customer to use.
- Differential voltage output technology: as for each line with voltage, there is differential voltage between two adjacent wires.

- Modification of host parameter setting by host control panel is available: pulse period and pulse amplitude can be adjusted freely, fully meeting the customer's demand.
- Short circuit, open circuit, tamper alarm and tamper detection are very sensitive, with self-detection of equipment fault.
- With an alarm horn inside the host, when host releases alarm signal, the horn will make a sound to prompt.
- The delay of circuit and open circuit alarm can be set freely, with setting of 1s in the fastest and 60s in the slowest and the false alarm rate is very low.
- The appearance design of waterproof shell and down outlet will lead to the development of the industry.
- There are various remote concentrated management schemes such as RS485 bus control, keyboard controller, PC software and network management software. With very steady communication, as multiple defense areas connected, the alarm response is very quick.
- DC12V and normally open/normally closed dry contact alarm output. DC12V alarm output can drive two alarm equipment of 12V directly. The switch signal output can be matched with various modern security products.
- Setting of organizing and withdrawing defense: the setting of organizing and withdrawing defense is available by keypad controller or PC software; the double defense host can set organizing and withdrawing defense of the host internal defense independently without interference.
- As for the host interface design, the heavy current and weak current go different wires. Compared with the traditional host, the humanized interface saves the customer's construction and installation time dramatically.
- As the power consumption of fence host is very low, when the external 220V power is cut, the battery life can sustain more than 8 hours.

1.3 Technic parameters of product

1.3.1 Power supply

As for power supply, use power adapter of which the parameters are:

Input: AC100V-240V 50Hz;

Output: DC18V 2A

1.3.2 Use environment

1.3.2.1 Temperature: $-30^{\circ}\text{C} \sim +55^{\circ}\text{C}$

1.3.2.2 Humidity: $\leq 95\%$

1.3.3 Output parameters

- Peak value of output high voltage: $5\text{KV} \sim 10\text{KV}$
- Peak value of output low voltage: $700 \sim 1000\text{V}$
- Peak value of pulse current: $<10\text{A}$
- Duration of pulse: $\leq 0.1\text{s}$
- Interval of pulse: 1s
- Maximum output power of single pulse: 2.5mC
- Maximum output energy of single pulse: $\leq 5.0\text{J}$
- Power consumption of system: $<5\text{W}$

1.4 Characteristics of product classificatory function

1.4.1 Classified by display

At present the hosts are all LCD series.

LCD has a rich content of display, and the working status of corresponding defense area is displayed independently. The content of display is:

1. Oscillogram of pulse output
2. Defense area ID, working mode, pulse amplitude, pulse period
3. Alarm status
4. Power state
5. System real-time clock
6. Host internal temperature monitoring display

1.4.2 Classified by wiring system

According to the wiring number, the host can be divided into four wire system and six wire system.

1. Four-wire system host: there are two high voltage wires output from the host and another two high voltage wires from the end of fence go back to the host (one positive and one negative). The fence wiring mode is differential mode with one positive and one negative alternately. The fence end 1 and 3 connect with each other while 2 and 4 with each other.

2. Six-wire system host: there are two high voltage wires output from the host and another four high voltage wires from the end of fence go back to the host (two positive and two negative). The fence end 1, 3 and 5 connect with each other while 2, 4 and 6 with each other.

1.4.3 Classified by defense area

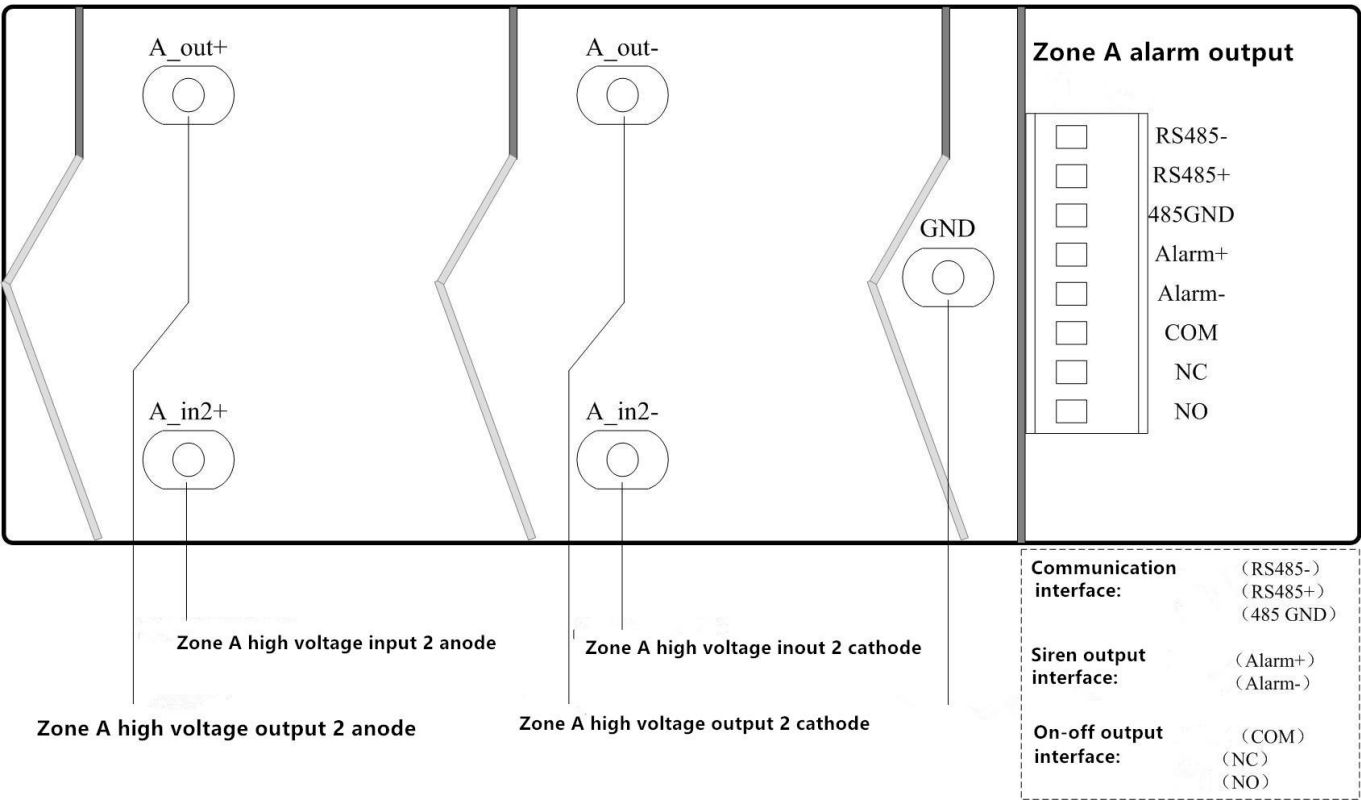
According to defense area, the host is divided into single defense area and double defense areas.

Single defense area: as it is called, inside the host there is only one defense area.

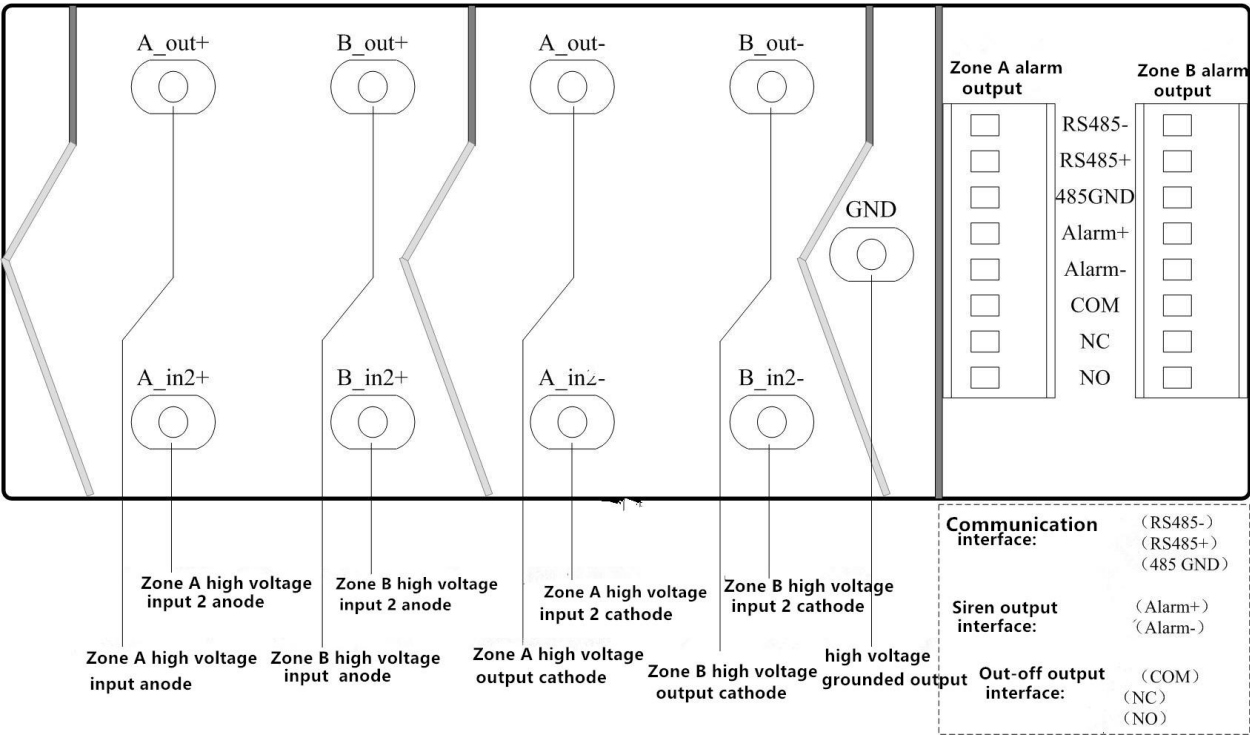
Double defense area host: there are two defense areas inside—defense area A and defense area B. These two defense areas can work independently, organizing and withdrawing defense independently. This double defense area host is a real one in the industry of electric fence.

1.5 Diagram of controller bottom wiring

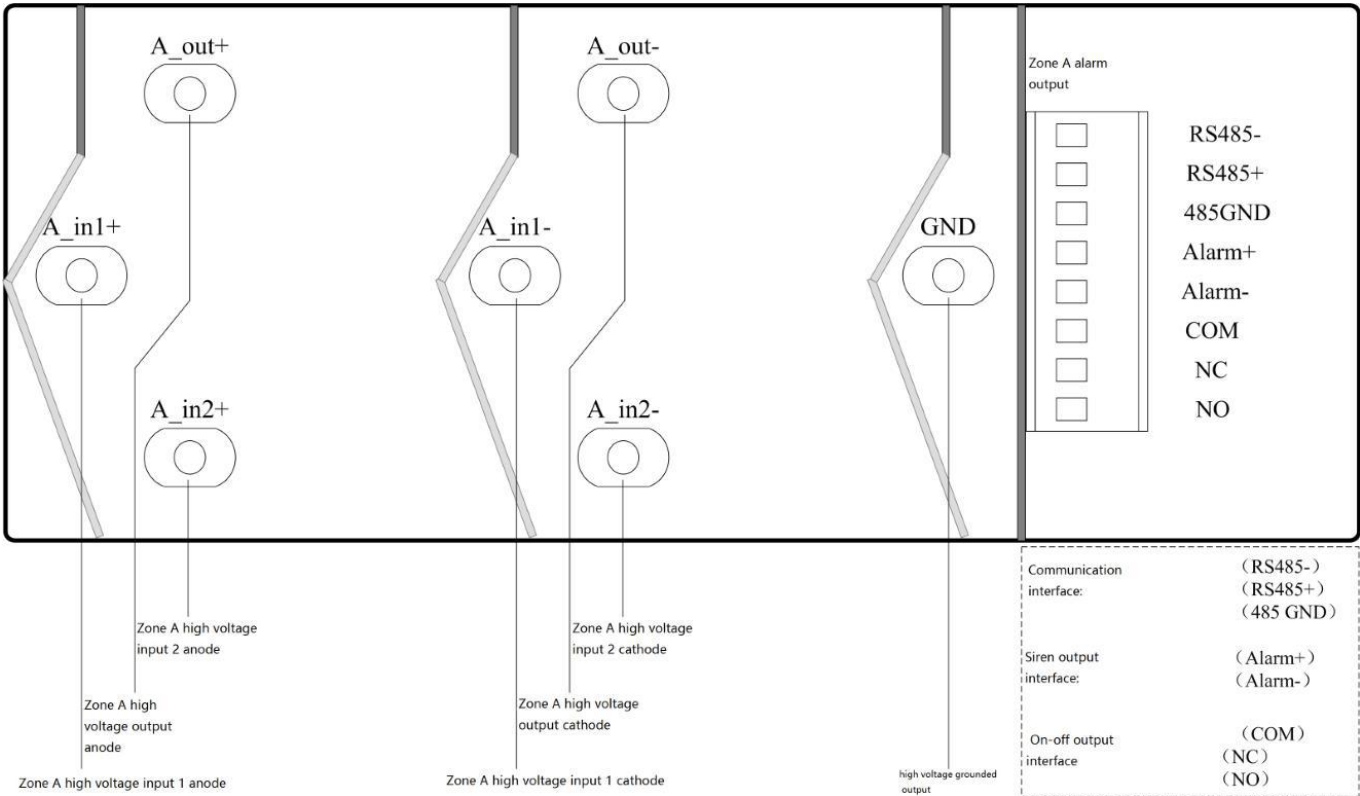
1.5.1 Instruction of host bottom wiring for four wire system single defense area



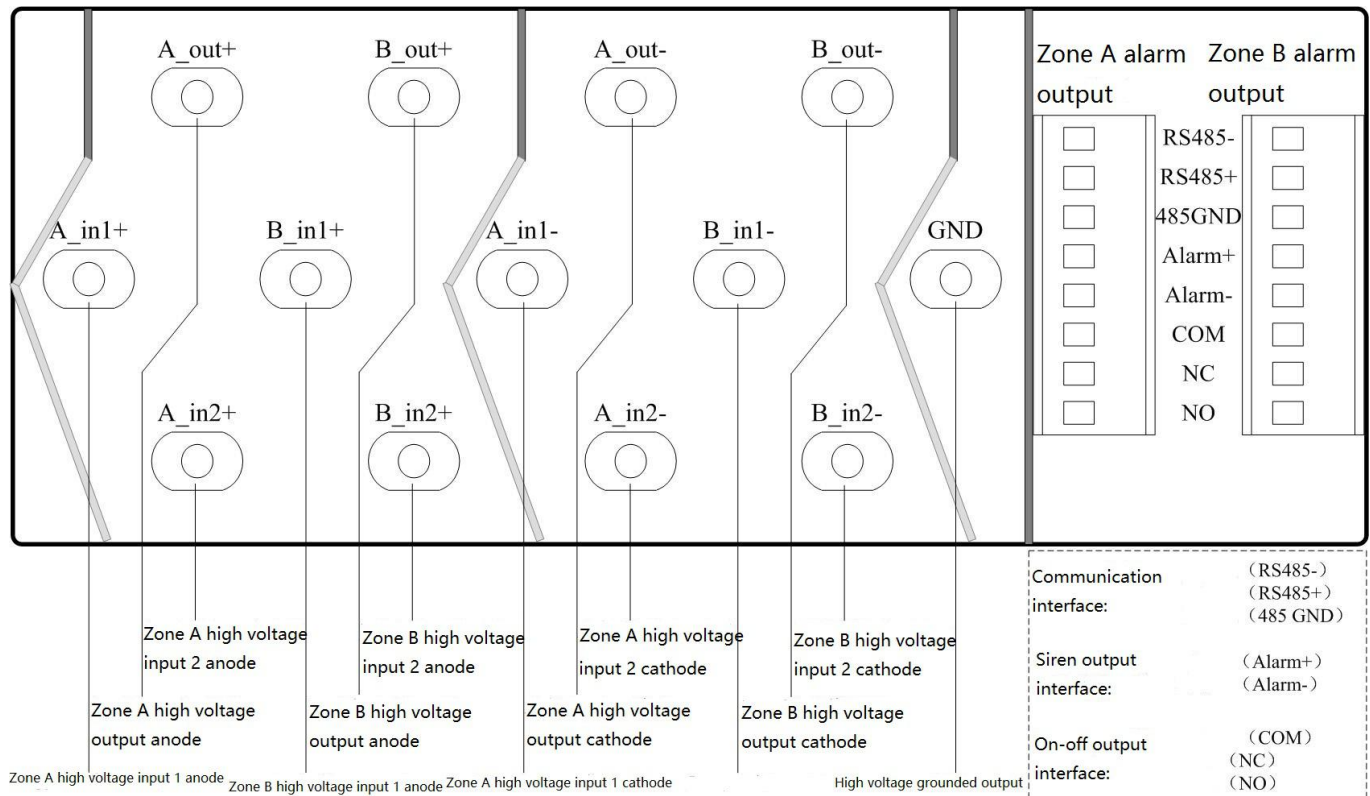
1.5.2 Instruction of host bottom wiring for four wire system double defense areas



1.5.3 Instruction of host bottom wiring for six wire system single defense area



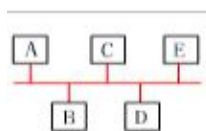
1.5.4 Instruction of host bottom wiring for six wire system double defense areas



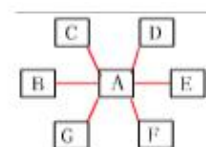
1.6 Instruction of function of controller host interface

1.6.1 High voltage grounding output: sharing grounding output with arrestor grounding is available. Notice to connect with 485 communication protection grounding separately.

1.6.2 485 bus interface: accessible directly to keypad controller or to PC software to perform remote control after RS485 transferred into RS232. The connection of RS485 between each host should adopt tree connection mode. Star connection mode is not allowed.



Tree bus



Star bus

1.6.3 Switch signal output: output two groups of normally open/normally closed dry contact signal and connect with other required linkage equipment. The single defense area host is correspondent to one switch signal output. The double defense area host has two switch signal output: correspondent to the

switch signal output of defense area A and defense area B respectively. The two switch signal outputs respond to alarm information of defense area separately.

1.6.4 Alarm output: when alarming output DC12V voltage and the host outputs 12V driving two audible and visual alarm lamps of 12V.

1.6.5 Power switch: when commercial power is normally supplied, turning off the power switch will turn off the fence host. When commercial power is cut off and the fence host switches into the battery power supply automatically, turning off the power switch will not turn off the fence host.

1.6.6 Power input: as standard adapter is adopted, what the customer should only do when using is to insert DC connector of the adapter into DC socket of the host and insert plug of the adapter into 220V commercial power. All series of hosts are accessible to external backup batteries.

1.7 Instruction of host control panel buttons

Instruction of host buttons

1、FUN: This button is “function” button.

In normal situation, pressing this button once will enter host parameter setting interface where each parameter of the host can be set (including defense area ID, pulse output voltage value of defense area, pulse output period of defense area, voltage of rank of defense area, host local time, etc.)

When in the host parameter setting interface, pressing this button once will cancel parameter setting and quit the host parameter setting interface.

2、OK: this button is “ok” button

When in the host parameter setting interface, pressing this button once will save current parameters and after the flickering of LCD display, will quit the host parameter setting interface.

3、Left: this button is “move cursor left or forward” button.

When in the host parameter setting interface, pressing this button once will make cursor move a step left or forward. It can be used to select the parameter requiring setting.

4、Right: this button is “move cursor right or backward” button.

When in the host parameter setting interface, pressing this button once will make cursor move a step right or backward. It can be used to select the parameter requiring setting.

5、Increase: this button is “increase” button.

When in the host parameter setting interface, pressing this button once, the value of place where the

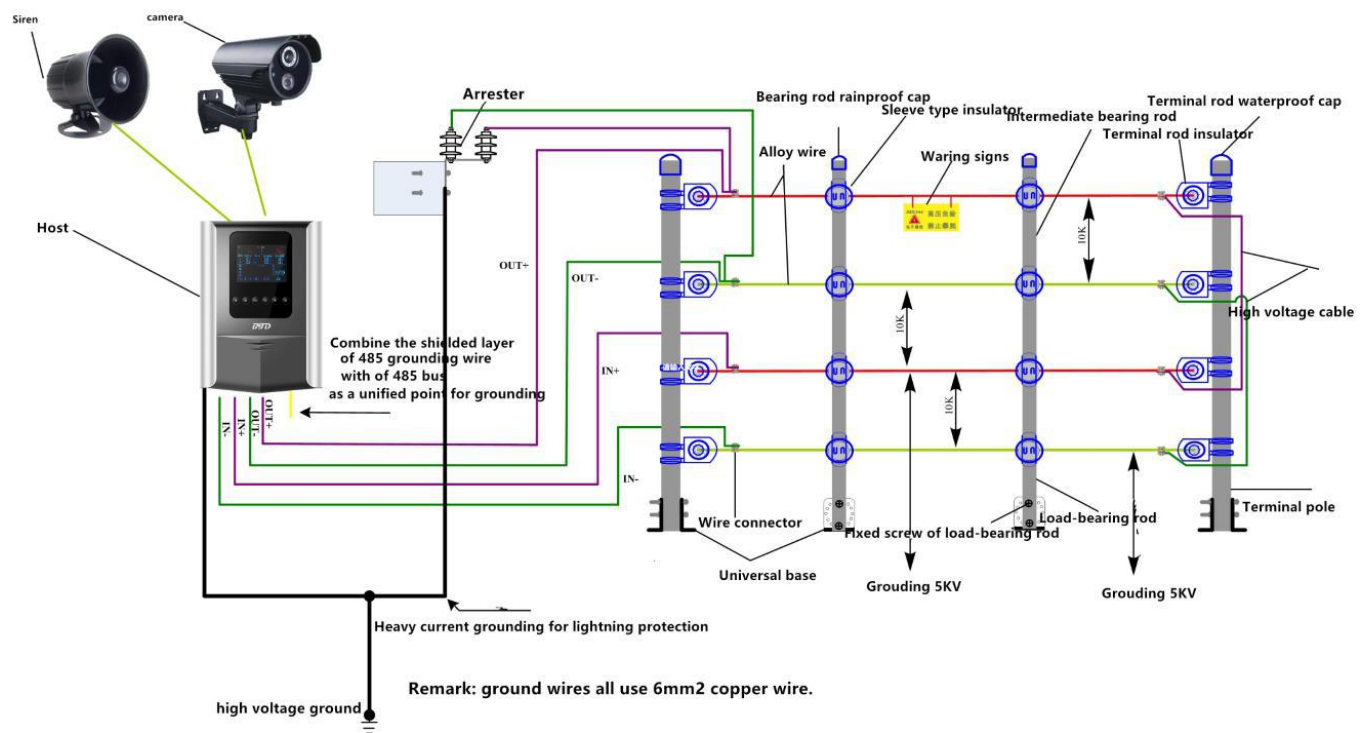
cursor stays will increase. It can be used to modify the parameter requiring setting.

6、Decrease: this button is “decrease” button.

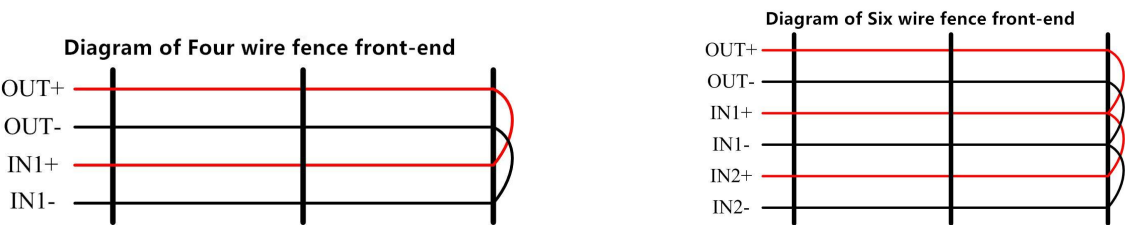
When in the host parameter setting interface, pressing this button once, the value of place where the cursor stays will decrease. It can be used to modify the parameter requiring setting.

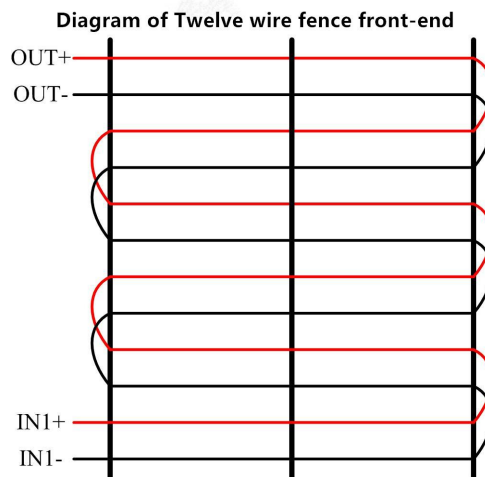
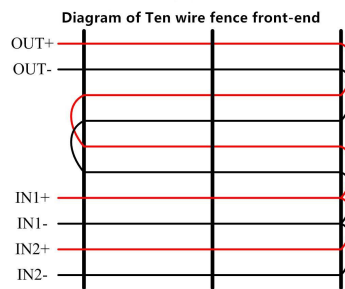
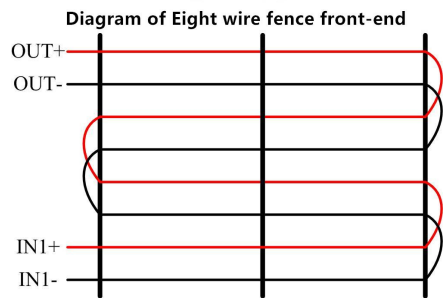
1.8 Diagram of host system connection

1.8.1 Actual picture of host front-end construction

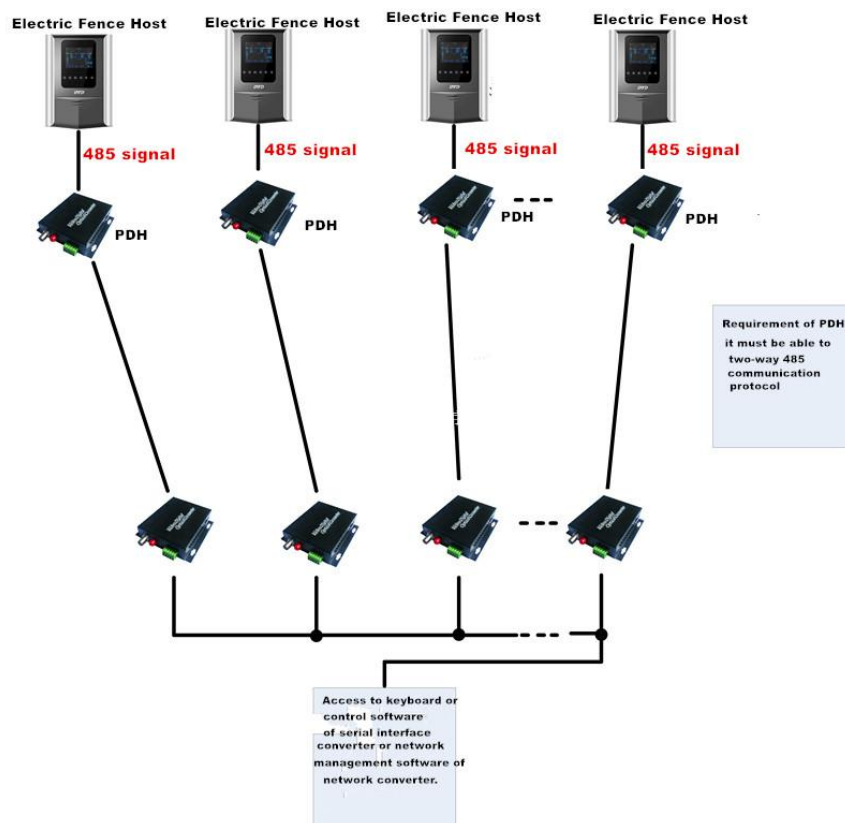


1.8.2 Diagram of host front-end





1.8.3 Diagram of host control



Bus wiring diagram of using PDH instead of 485

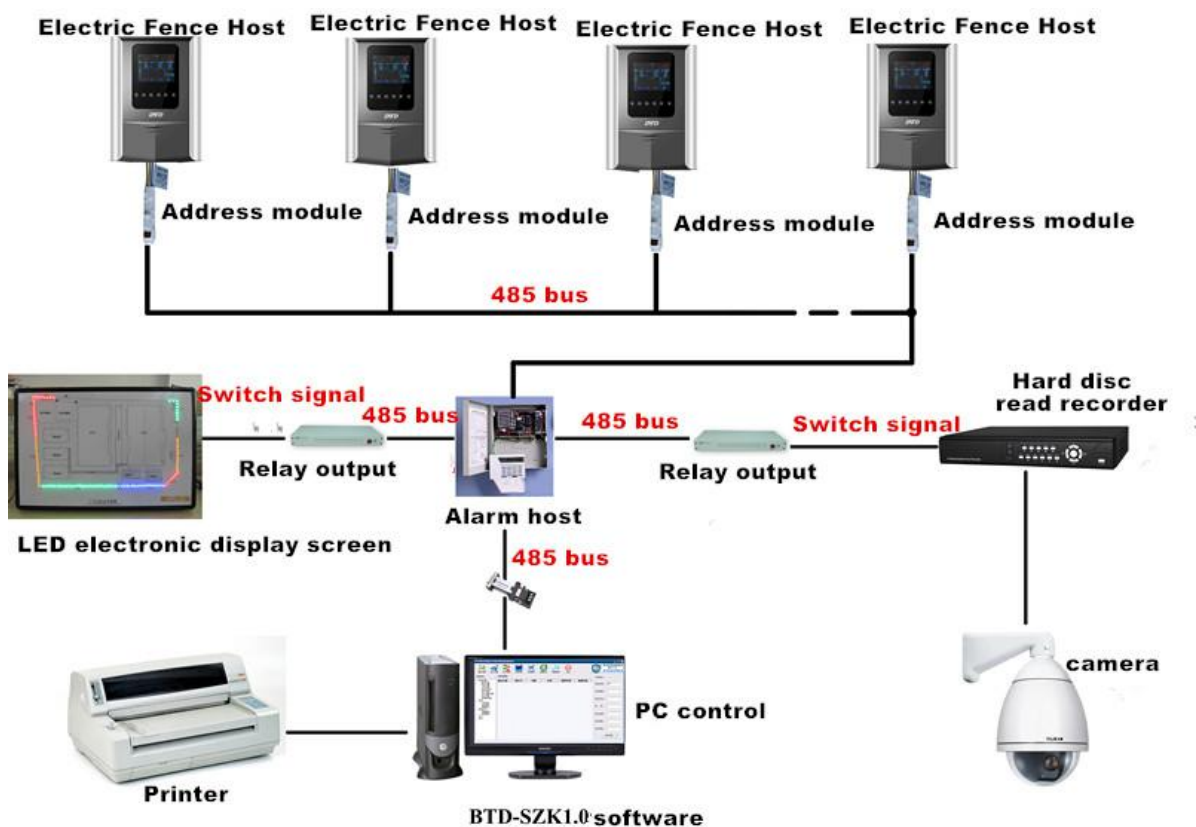


Diagram of alarm host control

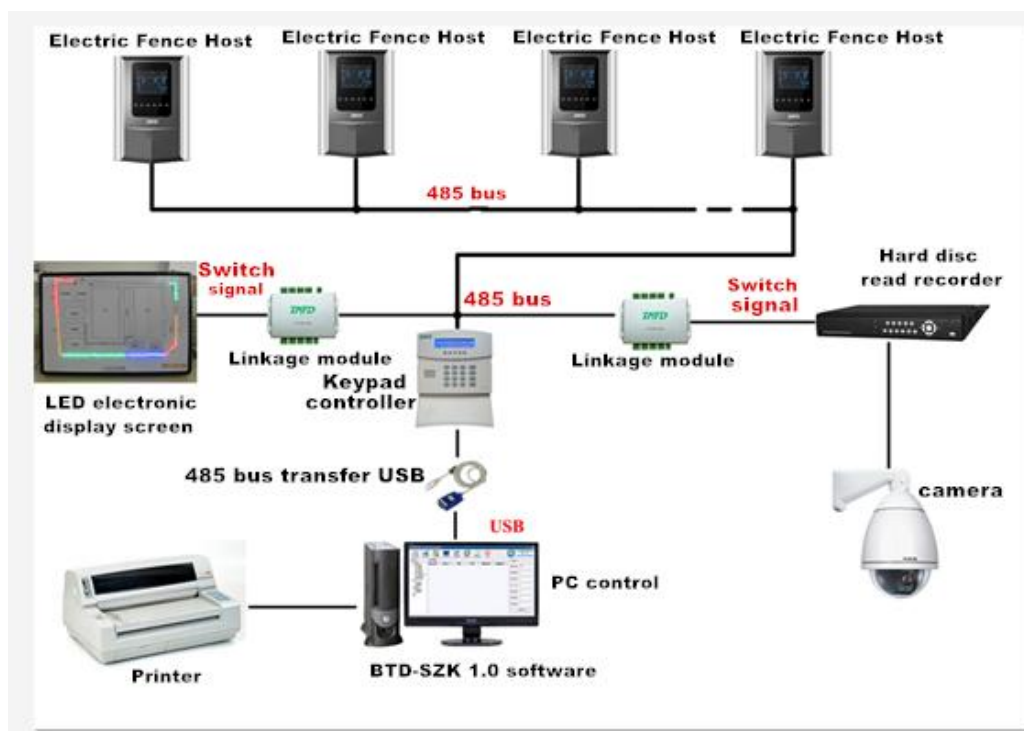


Diagram of PC software control

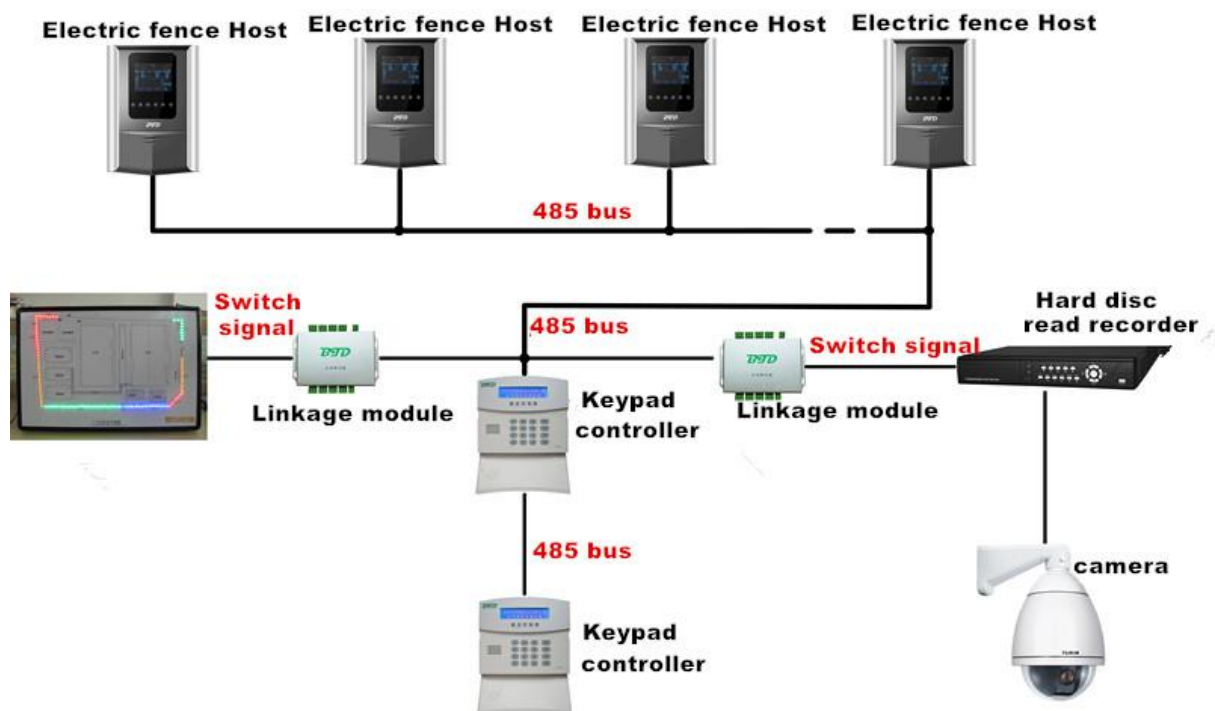


Diagram of keypad control

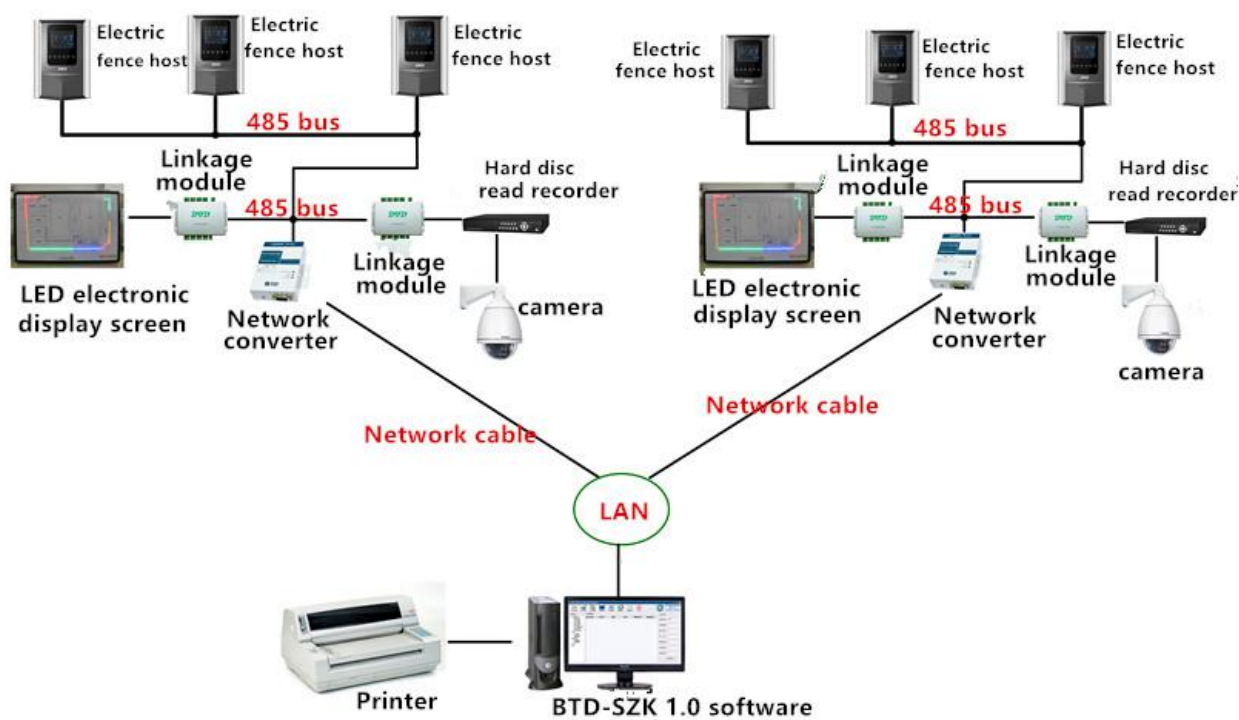


Diagram of network control

Chapter 2 Host debug and alarm test

2.1 Power-on test

When the installation of electric fence host of the system and electric fence front-end fittings completes, a comprehensive inspection should be conducted. Check if the wire clips is firmly fixed, position of insulator is right, conductor construction is normal and earth resistance of grounding wire meets the requirement; check if the insulator resistance of electric fence meets the requirement; check if the high voltage insulator conductor connection between fence and controller is correct, other functional interfaces of the host are right, and after confirming all wirings are completely correct, check if all staff have left the perimeter fence.

2.1.1 After connecting with the standard adapter, turn the power switch to “I” position and the system enters self-inspection status. After 1 second, the host displays normally and the power indicator lamp is on.

2.1.2 After the access to electric power, organizing defense indicator lamp is on, the system default output pulse is high voltage of 5.0kv and the host makes a little stronger impulse sound of “da da”. When switching the button to low voltage mode, the host internal sound is very small. When setting working mode to “Auto”, the high-low voltage mode will be directly controlled by keypad controller or PC software(when the host is working with other voltages of rank, the keypad controller or PC software will not organize or withdraw the defense with the fence host.

2.1.3 In the condition of high, low voltage or automatic status, the keypad controller or PC software is able to display the actual output voltage of each defense area correctly and the fence host indicator lamp is able to indicate the current defense area status correctly.

2.1.4 Keypad controller, PC software display correspondent to the host indication

2.1.5 That above displays are all correct without alarm output means the system is operating normally.

(Note: When there is more than one fence host in the same fence system which needs centralized control by keypad controller or PC software, after the power-on inspection of the host, the defense area numbers of each fence controller need to be changed by keypad controller or PC software independently so that the

defense area number of each fence controller will be unique in the same system to ensure of no conflict during communication. The defense area number can be set as any number from 1 to 96. The system default defense area number of single defense area host is 2; the system default defense area number of double defense area host is 1 and 2. When modifying defense area number of single defense area host, direct change from defense area number ** to defense area number ** is available. The defense area number modifications of single and double defense area host are different. When modifying defense area number of double defense area host, only the first number of the host can be modified (the modification of the second number of the host is not available), for example, when performing the following operations on the default double defense area host: change defense area number 1 to number 2 and the defense area number of the double defense area host after modifying the defense area number will become “2, 3”. After all setting work is done, all the fence control hosts shall be connected with each other by tree connection mode.)

2.2 Alarm test

2.2.1 Short circuit test: Use metal wire to short any two adjacent fence wires or grounding wires, the fastest the host alarms in 1 second and the short circuit red alarm indicator lamp on the panel is on. After removing the cause, the host alarm resets automatically after another 30 seconds alarm and the system returns to normal. (Except the reset by keypad controller and PC software)

2.2.2 Open circuit test: Remove any high voltage insulation wire from wiring terminal, it will alarm immediately in the fastest and in 2 seconds at most even in the lowest with the open circuit indicator lamp on the panel on. After removing the cause, the host alarm resets automatically after another 30 seconds alarm and the system returns to normal. (Except the reset by keypad controller and PC software)

2.2.3 Inside the host there also set fault alarm function. In the event of failure of the host, it will prompt alarm information and output alarm signal.

Chapter 3 Use and maintenance

3.1 Inspection

When the installation of load-bearing rods, insulators, wires, jumper wires, high voltage insulator wires, grounding wires and pulse host all completes, a comprehensive inspection should be conducted. Check if the wiring clips are firmly fixed with right position, the position of insulators is right and wiring construction is normal. The wires which are not pulled tightly enough will cause swing easily while the wires which are pulled tightly excessively may break the wire and may crook the terminal rods as well. Check if the jumper wire is good. The jumper wire should be relatively stable to ensure enough discharge intervals and should be connected with main wire closely with good contact. Check if the grounding wire is good with the grounding resistance meeting the requirement. Check if the high voltage insulator wire signal and circuit which are induced to the main controller thread in separated pipes with correct connection of beginning and end. Check if the system insulator resistance meets the requirement.

3.2 Battery management

In the case of pulse host with battery, firstly access to AC220 power (if there is no 12V battery but only AC 220V power, the system can work normally; if there is 12V battery alone, make sure to access to AC 220V power first, and then switch to the battery which can keep working for 8 hours), when the host switch is at “o”, the host stops, and only when the commercial power is cut off, can the power supply of the host be switched from commercial power to battery power. The host will charge the battery all the time during normal use.

3.3 Treatment of common problems

3.3.1 Connection of lightning arrestor

There are two sides of lightning arrestor, the side with characters upside and the other without characters downside for grounding. The detailed connection method refers to the instruction of installation. One defense area is correspondent to two lightning arrestors. Firstly, fix the lightning arrestor

on the lightning arrestor fixings, and then connect the terminal rod close to the host (notice the side with characters upside and the other without characters downside for grounding) with the first wire of one of the two lightning arrestors, and the second wire of the other lightning arrestor.

3.3.2 Host starting up warning

It can be classified as three types:

When host alarms due to short circuit or open circuit, firstly investigate if it is host failure or fence front-end failure. The method is to cut off the host power first and remove the high voltage wire connecting host and fence, using common wire to short circuit the high voltage circuit (“+” means one circuit, “-“ means the other), and then turn on the power. If the host operates normally, it means the failure of fence front-end, if the host displays alarm, it means the operation failure of the host.

1、Tamper alarm. Access the power of the host, turn on the power switch and it displays tamper alarm. As for this, whether the host casing is open or not should be checked as the tamper alarm means the host alarms as soon as the casing is opened. If the casing is not open, but the host still displays tamper alarm, it means the failure of the host triggering tamper alarm.

2、Short circuit alarm: investigate if it is the host failure first. If not, it means two circuits have short circuits, (1, 3) circuits and (2, 4) circuits occurring short circuit. Focus on the inspection of connection between the host and high voltage wire, terminal rod wire jumper and defense area end wire jumper. Testing by multimeter can be also adopted.

3、Open circuit alarm: firstly investigate if any failure in the host. If the host is normal, it means the failure of front-end circuit. If using multimeter in spot, the investigation will be much easier. Firstly remove the high voltage insulation wire from the host high voltage rod, and then test the circuit if it is normal. If no mulimeter, there is also a method to confirm: first short one circuit of the fence with a common wire (for example, circuit 2, 4), with another circuit (circuit 1, 3) connected with the front-end circuit separately and turn it on. If the host operates normally, it means the correspondent circuit is normal. If displaying open circuit alarm, it means the circuit is open. Focus on the inspection of the terminal rod wire jumper and the short circuit of defense area end.

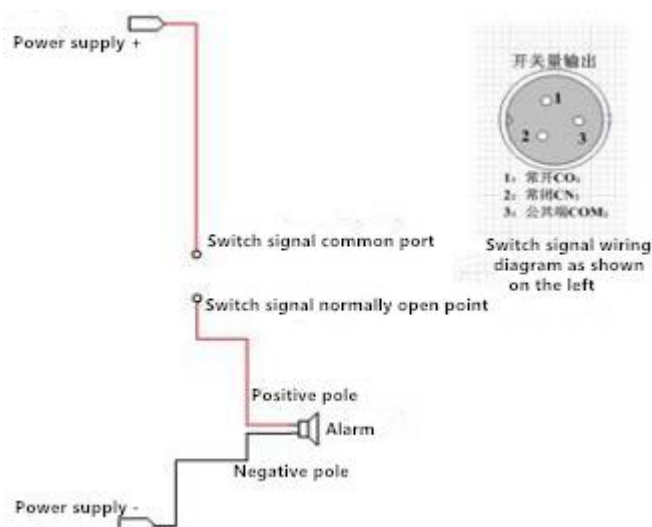
3.3.3 Alarm connection

After the host triggers alarm, the alarm interface will output 12V power. Notice positive and

negative pole connection when using.

3.3.4 Switch signal linkage alarm, alarm lamp

There are three contacts of the host alarm switch signal output: common contact, normally open contact and normally closed contact. After the host triggering alarm, the normally open and closed signal will interchange: the normally open signal becomes the normally closed signal; the normally closed signal becomes the normally open signal. The switch signal only plays a role of a switch and will not supply power itself, thus, external power supply is needed in the situation of linkage alarm of equipment.



3.3.5 Switch signal

When the host adopts alarm host control scheme, the differentiation between 485 signal of electric fence host and 485 signal of alarm host needs to be paid attention to. These two signals are all 485 signals but belong to two different systems, so they cannot be connected with each other. The 485 signal of alarm host can only be accessible for the 485 signal of address module. The 485 signal of electric fence can only be accessible for keypad controller or host-computer controlling software. The address module alarm input of the alarm host and the switch signal output of the electric fence host connect with each other to form a controlling scheme.

3.3. 6 Communication failure

There are several situations for communication failure:

The communication of power-on, keypad or PC software displays failure after the completion of

system wire connection. As for this situation, if there is failure in keypad or the host itself should be checked. The solution is to test the host and keypad controller together, testing them one by one without getting through the bus wire. If displaying the communication is normal, it means not the equipment failure but the problems of the wiring of bus wire (this failure can be also tested by 485 wire with the interchange of positive and negative pole, because it is possible that reverse welding may occur in the production of the aviation first line which is the external connection with the host; if displaying the failure of keypad communication, it means there's failure in the host or keypad itself.

(2) In the system there is more than one electric fence host, the host only displays the defense area 2 is normal and the communication of other defense areas fails; this problem belongs to the problem that the default of all hosts is defense area 2 due to unmodified defense area of electric fence hosts in the system.

(3) After modifying defense areas, the correspondent defense area displays normal, but the previously normal defense area displays communication failure; this situation means the hosts with the same defense area number as this host did not turn off during modification so that all of the defense areas sharing the same number are modified in the modification of defense area.

(4) After the modification of defense area, the host only displays the communication of defense area 2 is normal but the information of other defense areas cannot be checked; this means the host does not open the correspondent defense area so the keypad controller opens the defense area 2 only in default with others closed. Then just open the correspondent defense area.

3.3.7 Treatment of other common problems

1. The keypad controller makes sound at intervals. This situation means the resetting after the alarm. The host will reset automatically after 30s with alarm record in the keypad controller. Then just operate the keypad controller to do reset operation to tackle the problem.

2. The host cannot be turned off. After accessing it to power, the customer switches the host power in the hope of turning it off, but receives no reaction; this situation means that the customer has pulled out the host external power before turning it off. What the customer only needs to do is to insert the external power and open the switch again.

3. No alarm signal released after the host triggering the alarm

There are several situations:

(1) There is no signal released from the host after short circuit, open circuit alarm or customer triggering alarm. This problem originates excessively short triggering time. As the impulse period of the host is 1 second, plus the host alarm sensitivity setting, the time triggered by short circuit and open circuit must exceed the alarm sensitivity time, otherwise, the host will not release the alarm signal. **Moreover, the tamper alarm does not need time, it will alarm as soon as be triggered.**

(2) There is triggered alarm with the host, but no prompts on keypad controller. This means there is failure in the communication between the host and the keypad.

(3) There is triggered alarm with the host with the indicating lamp on the displaying panel on, but there is no reaction of external audible and visual alarm lamp or alarm. This situation has two possibilities, of which one is incorrect interface wiring between the external alarm and the host alarm, and the other is the failure of the host which should have output 12V voltage.

3.4 Notice

3.4.1 The system has pulse voltage of nearly 5,000V. Be sure to pay attention to separated wiring of heavy current and weak current to avoid abnormal operation of the host and even the possible damages to the host during construction; do not touch the live part directly to avoid electric shock during testing.

3.4.2 The modification of defense area can only be done one by one. When modifying the defense area number of one of the hosts, close other hosts with the same defense area number in the system.

3.4.3 The input voltage of the host power adapter should not be more than 240VAC, so the introduction of 380VAC is absolutely prohibited in the access to power.

3.4.4 The wiring in rain-proof box must be paid attention to. The wiring of high voltage and low voltage cannot be mixed together and should draw out of two holes of rain-proof box respectively.

3.4.5 As for the wiring of low voltage part of the host, customer must pay attention to the insulation without the wire exposed when using these wires, otherwise, it will cause short circuit and damage the host system.

3.5 Use

3.4.1 Personnel training: the main content is safety education and introduction of system performance and its use method. The project contractor must train the operators before putting it into service.

3.4.2 Take an operation record

3.6 Routine maintenance

Pulse host: surficial cleaning once a month when power cut-off.