COREMORROW
Piezo Nano Motion

E82.C256K Series Piezo Controller

User Manual

Version: V1.0

This document describes the following products:

■ E82.C256K Open loop controller 256 channels

DECLARATION

Declaration!

This user manual is a integrated user manual of the E82.C256K series piezoelectric controller. Please read this user manual carefully before using this controller. Follow the instructions in the manual during use. If there is any problem, please contact us for technical support. If you do not follow this manual or disassemble and modify the product yourself, the company will not be liable for any consequences arising therefrom.
Please read the following to avoid personal injury and to prevent damage to this product or any other product connected to it. In order to avoid possible hazards, this product can only be used within the specified range.

Notice!

Do not touch any exposed ends of the product and its accessories.
There is high voltage inside. Do not open the case without permission.
Do not connect or disconnect input, output, or sensor cables with power on.
Please keep surface of E82.C256K clean and dry, don't operate in humid or static environment.
After use, output voltage should be cleared to zero before turning off the controller switch, such as switching the servo state to the open-loop state.

Danger!

The piezoelectric power amplifier described in this manual is a high-voltage device capable of outputting high currents, which can cause serious or even fatal damage if not used properly.
It is strongly recommended that you do not touch any parts that connect to the high voltage output.
Special Note: If you connect it with other products in addition to our company, please follow the general accident prevention procedures.
Operating the high-voltage amplification requires training professional operators.

Warning!

If the voltage exceeds the PZT's tolerable range, it will cause permanent damage to the PZT. Before adding voltage to the PZT poles, it must be ensured that the positive and negative poles of the PZT are connected correctly and the operating voltage is within the allowable range of this PZT.

Cautious!

E82.C256K housing should be installed on a horizontal surface in an area with a 3CM air flow area to prevent internal convection in the vertical direction.
Insufficient airflow can cause equipment to overheat or premature instrument damage.

Contents

1.Security

1.1 Introduction

▷ E82.C256K is a multi-channel piezoelectric ceramic drive controller designed according to according to customer's requirement..

▷ The circuit part of E82.C256K is closed.

▷ E82.C256K heat dissipation for forced air cooling.

▷ E82.C256K is used to drive capacitive loads (such as piezo actuators).

▷ Pay special attention that E82.C256K cannot be used to drive resistive or inductive loads.

▷ E82.C256K has an open-loop operation mode.

1.2 Safety Instructions

E82.C256K is based on the national safety standard. Improper use may cause personal injury or damage to E82.C256K . The operator is responsible for the correct installation and operation of E82.C256K .

▷ Please read the user manual in detail.

▷ Please eliminate any faults and potential safety hazards caused by the faults.

If the protective ground wire is not connected or connected incorrectly, there will be a possibility of leakage. If you touch E82.C256K , it may cause serious or even fatal injuries.

If E82.C256K opened without permission, touching the live parts may cause electric shock, resulting in serious or even fatal injury or damage to E82.C256K .

▷ Only authorized professional technicians with corresponding qualifications could open E82.C256K .

▷ When opening E82.C256K series controller, please disconnect the power plug.

▷ Please do not touch any internal parts when operating under bare conditions.

1.3 Notes

▷ The contents in the user manual are all standard descriptions, and the customized parameters are not explained in detail in this manual.

- The latest user manual is available for download on CoreMorrow website.
- When operating E82.C256K, the user manual should be placed near the system for easy reference in time. If the user manual is missing or damaged, please contact CoreMorrow customer service department.
- Please timely add all the information given in the manufacturer's user manual, such as supplements or technical descriptions.
- If your user manual is incomplete, it will miss a lot of important information, cause serious or fatal injuries, and cause property damage. Please read and understand the content in the user manual before installing and operating E82.C256K.
- Only professionals who are authorized to meet the technical requirements could install, operate, maintain and clean E82.C256K.

2. Introduction

E82.C256K deformable mirror driver is a customized multi-channel piezo controller. It can provide piezo with high stability, high resolution driving voltage, excellent frequency response and very low static ripple.

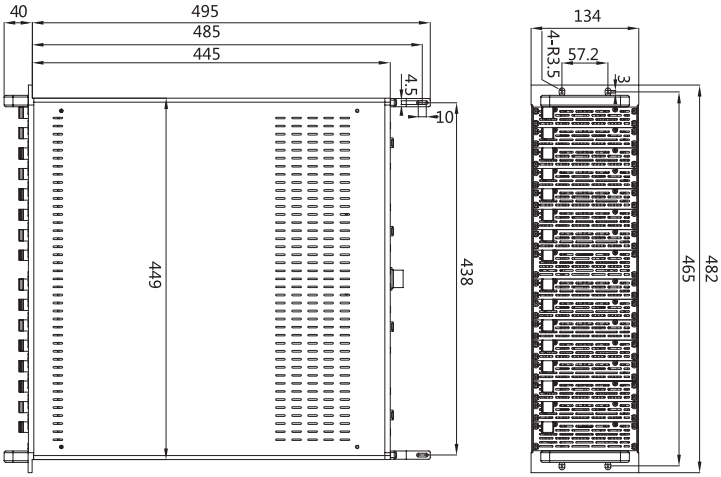
2.1 Features

▷ Adopt high thermal conductivity radiator for forced wind cooling, improve heat transfer ratio, heat dissipation efficiency and MTBF of the driver in limited space.

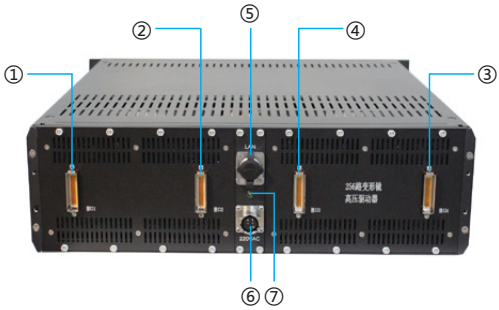
▷ The drive circuit adopts "module" design, each module integrates 16 drive output channels. The modules and chassis are assembled by sliding rail, which is convenient for assembly, maintenance and overhaul.Each module is equipped with an independent cooling profile, which greatly improves the cooling area of the module power device and extends the life of the driver.

▷ The height of the case is 3U, the width is 8U, the depth is 495mm and the weight is 26kg. Small size, light weight, high space utilization, convenient transportation and debugging.

2.1.1 Drawings



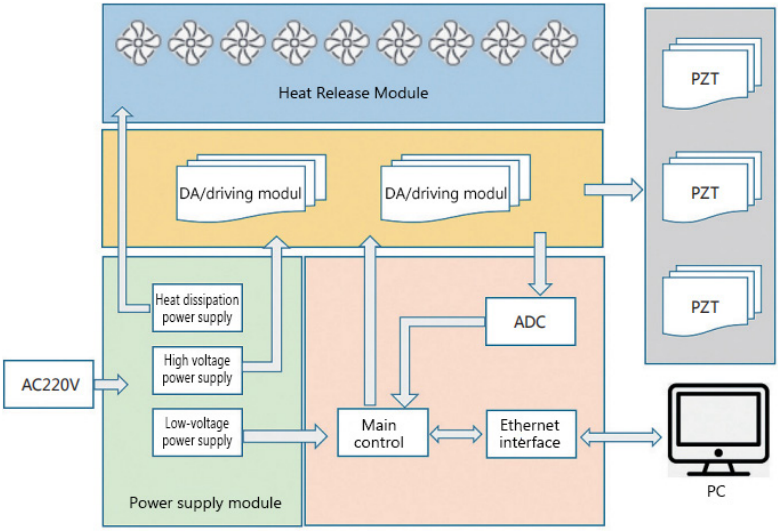
2.1.2 Panel



No.	Symbol	Function
1	Interface 1 Output drive (74pin connector)	Interface 1 drive output interface, CH1-CH64 output terminal.
2	Interface 2 Output drive (74pin connector)	Interface 2 drive output interface, CH65-CH128 output terminal.
3	Interface 3Output drive (74pin connector)	Interface 3drive output interface, CH129-CH192 output terminal.
4	Interface 5 Output drive (74pin connector)	Interface 4 drive output interface, CH193-CH256 output terminal.
5	Ethernet communication port LAN	The upper computer is connected with the interface module of E82.C256K through the Ethernet port access terminal to control the upper computer
6	Power 220VAC	Power connector.Connect through AC220V AC power supply.
7	POWER LED Green	Turn on the power indicator, E82.C256K is in working.

2.2 Block Diagram

E82.C256K is composed of power supply module, main control module, power amplification module, heat dissipation module and control card.



2.3 Circuit Composition

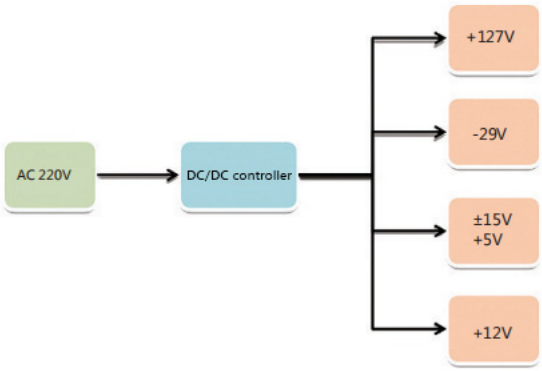
2.3.1 Power supply

The power supply module is designed based on DC/DC switching power supply, which can convert +127V, -29V, ±15V, +5V, +12V direct current, providing power supply voltage and power for the drive control module. The power supply module of the scheme has high efficiency, high reliability, stable operation and can meet the driving control indexes.

It is composed of high-voltage and high-power power supply circuit, low-voltage power supply circuit and power supply circuit of heat dissipation part:

- High voltage power supply: +127V, -29V
- Low-voltage power supply: : +5V, ±15V

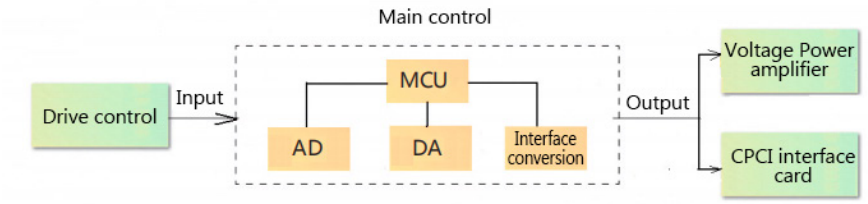
- Power supply for cooling part: +12V



2.3.2 Main control

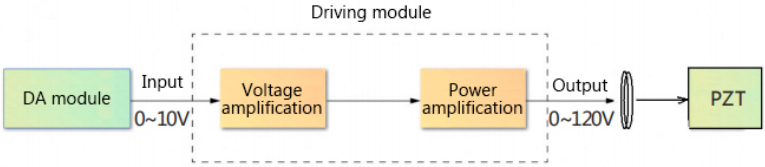
The main control is composed of high-performance MCU, Ethernet interface, DA module and AD module:

- High performance MCU:STM32H743IIT6 chip, containing SPI and ADC interfaces;
- Ethernet interface: WIZnet W5500 chip;
- DA module: DAC8568 DIGITal-to-analog converter, 16 bits, 8 channels, ultra-low burr, voltage output type, to provide the driver module to meet the requirements of -20V~120V analog signal;
- AD acquisition: The output voltage value is directly collected by the single chip microcomputer through analog switch switching (sampling: 10Hz/ channel) in the way of precise resistance voltage division.



2.3.3 Power Amplification

Power amplifier is composed of voltage amplifier circuit and power amplifier circuit, the 0~5V analog signal provided by the DA module is enlarged into -20V~+120V high voltage output, Case (1) single channel output power ≤ 5W. The most power amplifying circuit is the heating element, which is connected with the heat conduction department, and expends the heat through the heat dissipation module. Power amplification also has current-limiting protection function to prevent accidental short-circuit causing circuit burn down.

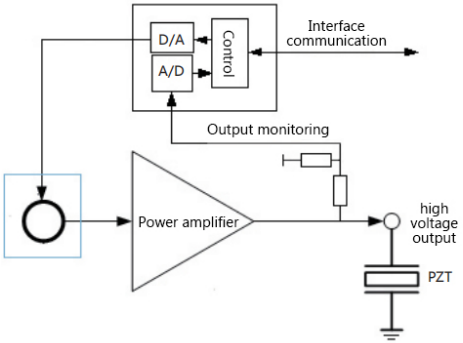


2.3.4 Heat dissipation

The heat dissipation consists of the heat conductiont, the heat dissipation and the fan. It is mainly used for cooling and heat dissipation of power supply module and power amplification module.Through the reasonable structure design, the heat transfer ratio and heat dissipation efficiency can be improved in the limited space, increase MTBF of the driver (mean-time-between-failures).

2.4 Piezo driving principle

The schematic diagram of the piezo driving principle is shown as following.



2.5 Ethernet Communication Interface and Software Protocol

W5500 Ethernet interface is used for E82.C256K ,On the one hand, in order to meet the compatibility problem of the communication control card with the user and the bandwidth requirement of 100 megabit Ethernet;On the other hand, to cooperate with MCU to maximize work efficiency. W5500 Ethernet Shield uses WIZnet W5500 chip and supports 3.3V&5V voltage. The Ethernet Shield is compatible with Arduino and ARM MBED platforms.

2.5.1 Communication Protocols

- In Appendix 3 "Network Communication Protocol for Piezo Actuator";
- In Appendix 4 "Piezo Actuator string command"

2.6 Parameter

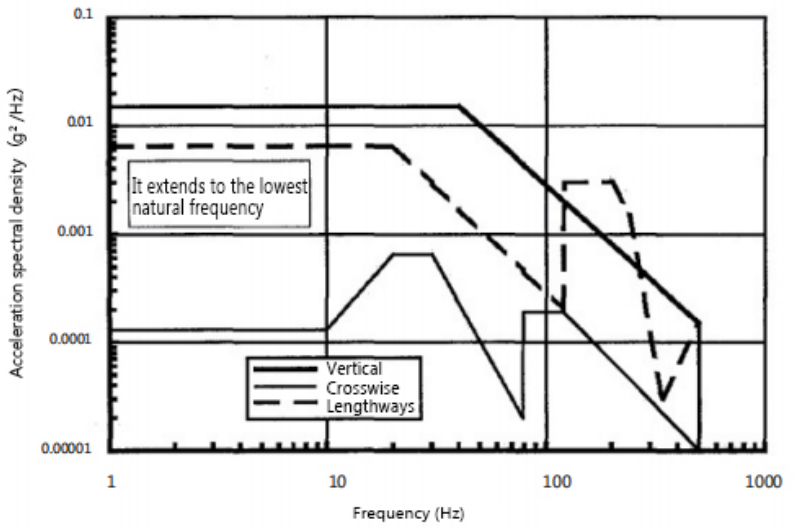
2.6.1 Main Parameter

Items	Parameter
Input voltage (V)	AC 220V
Output channel number	256 channels
Output interface	Catic photoelectric connector: J24H-74ZKH ×4 220VAC power supply connector: JY27467T13E03PN - H x 1
Single channel output voltage	-20V ~ +120V
output frequency	Square wave (50% duty cycle) not less than 1kHz @ 6.8 uF (0 to 5 v) load
Static acquisition function	Each channel can realize the voltage static acquisition function Acquisition resolution is better than 100mV
Output voltage resolution	better than 10mV
Output voltage ripple	≯ 50mV（Vpp）
Power on, power off voltage shock	≯ 5V

Communication interface	A hundred Megabyte Ethernet interface
19 inches 8U case	Volume:480mm（W）×134mm（H）×495mm（D）
Weight requirement	26kg
Short-circuit protection	Each channel has short circuit protection function
Ground resistance	Output connectors to the resistance between the "ground" Ω ⩾ 1

2.6.2 Condition

Items	Parameter
Operating temperature	-20℃～ +50℃
Storage temperature	-30℃～ +60℃
Vehicle vibration test	Appendix A2.2.2 Vibration requirements for the "Truck-Fastening Cargo" vibration environment.



Truck vibration environment on highway

2.7 Power Calculation

- Average output (Sine wave operation mode)

$$Pa \approx Upp \cdot Us \cdot f \cdot Cpiezo$$

Pa=Average output[W]

Upp=Peak and peak drive voltage [V]

Us=Drive voltage[V] ((Vs+) - (Vs-))

Cpiezo=Piezo actuator capacitance[F]

f=Operating frequency of the sine wave[Hz]

3.Open-Box

3.1 Inspection Operation

The electrical and mechanical aspects of E82.C256K have been carefully checked prior to shipment.When you receive the device, unpack the package and check the surface of the body for any obvious signs of damage.In case of damage, damage that may have occurred during transit, please contact CoreMorrow immediately.Please take good care of the original packaging materials for subsequent maintenance.

3.1.1 E82.C256K must include the following items:

- Case mounted module
- power line
- User manual of E82.C256K Piezo Controller (this document)
- Certification

3.2 System operation and Security measures

Attention! Improper installation of E82.C256K can result in personal injury or damage to E82.C256K!

- The installation and use of E82.C256K should be close to the power supply so that the power plug can be easily and quickly disconnected from the main power supply.

● Connect E82.C256K using the supplied power cable.

● If the power cable provided by our company must be replaced, please use a power line of sufficient diameter size and ensure effective connection.

Attention! Improper installation or placement of E82.C256K may result in high temperature or overheating during operation!

● In order to ensure effective heat dissipation, E82.C256K should be placed horizontally with a height of at least 3cm at the bottom to facilitate heat dissipation, with no shielding within 5cm around the system.

● Vertical direction to prevent internal convection, insufficient airflow will cause overheating or premature damage to the instrument.

● Ensure a well-ventilated working environment.

Attention! When connected to E82.C256K, the piezo actuator may cause oscillations, causing irreparable damage!

If you find an oscillation, follow these steps:

● When the closed loop operation mode is in use, turn off the servo mode immediately.

● Stop driving the piezo actuator immediately when the ring is in use.

● Power off E82.C256K.

Attention! If E82.C256K is used directly without preheating, thermal instability will occur!

● Before using E82.C256K, please power it for at least half an hour and then carry out the corresponding operation.

Attention! Pay attention to frost and dew when E82.C256K is electrified in winter, so as not to burn out the controller!

● Visual check whether the controller has frost and dew phenomenon before power on (frost and dew phenomenon usually occurs when moving from outdoor to indoor).

● If the controller frost, dew should be cleaned or dried and stored in the room for more than two hours before power on the relevant operation.

3.3 Electrical Inspection

Attention! If the instrument is retrieved from the outdoor temperature below zero, it

should be kept indoors for more than half an hour and then electrified!

1)Connect the interface.

2) Connect the power line.

3)Turn on the green light of the chassis panel.

4)Connect the software.

3.4 Cable Connection

After the system has passed the electrical inspection, the piezo actuator can be connected to the system for corresponding operation.Follow these steps:

- Turn off system equipment.
- Connect the piezo actuator

3.5 Beginning Operation

3.5.1 Computer operation

According to the factory test software or user-written software communication control directly.

4.Maintenance, Storage and Transportation

4.1 Cleaning Measures

Attention! The PCB circuit board of function module in E82.C256K is ESD (electrostatic discharge) sensitive equipment.Before use, these devices should take all precautions to prevent the accumulation of static electricity and avoid contact with the circuit element pins and PCB wiring. Before touching any electronic component, the body touches the ground conductor to release static electricity, ensuring that no conductive particles of any kind (metal, dust or debris, pencil leads, screws) enter the device. When cleaning, be careful not to drop the equipment and avoid any form of mechanical shock!

- Disconnect the power plug from E82.C256K before cleaning.
- Prevent cleaning fluid and any liquid from entering the system module to avoid

short circuit.

▷ The surface of the chassis and the front panel of the module can be wiped with a solution with an alcohol content of more than 95%. Do not use organic solvent to wipe the surface.

4.2 Transportation and Storage

This product is packed in cartons. Transportation must be carried out under the packaging conditions of the products. During the transportation, direct rain and snow attack, contact with corrosive gases and strong vibration should be avoided.

▷ The instrument can be transported by various transport under normal conditions, and the bad conditions such as dampness, load bearing, collision, extrusion and irregular placement should be avoided during transportation.

▷ If the instrument is not used for a long time, it should be packed and stored.

▷ The instrument should be stored in a clean and well ventilated room without corrosive gases.

▷ Use original packaging boxes during transportation to prevent improper packaging from causing damage.

5. Service and Maintenance

5.1 Disposal

▷ When disposing of old equipment, please abide by the national regulations and local regulations.Please dispose of the old equipment properly. Please contact CoreMorrow for the upgrade and replacement of old equipment in order to meet the customer's handling of system products.

▷ If you have an old device or an unusable device that cannot be handled, you can ship it to the following address:

Address: 1F, Building I2, No.191 Xuefu Road, Nangang District, Harbin, Heilongjiang

5.2 After-sales Service

- E82.C256K includes 2 spare parts of the drive PCB with 10% channel.
- Any part of E82.C256K is dismantled, there will be no warranty service.
- E82.C256K is a precision instrument which should be handled with care.
- In case of any problem, please record the problem and contact CoreMorrow to be repaired by professional technicians.

6.Contact us

Harbin Core Tomorrow Science & Technology Co., Ltd.

Tel: +86-451-86268790

Email: info@coremorrow.com

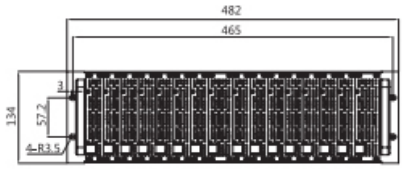
Website: www.coremorrow.com

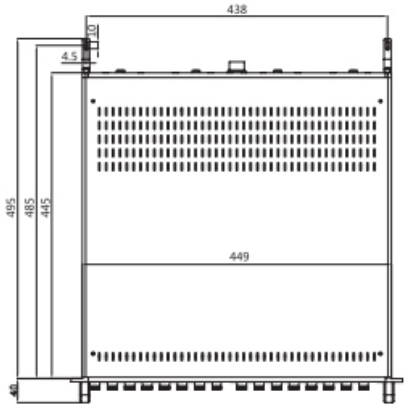
Address: Building I2, No.191 Xuefu Road, Nangang District, Harbin, HLJ, China

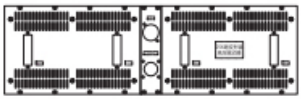
CoreMorrow Official and CTO WeChat are below:

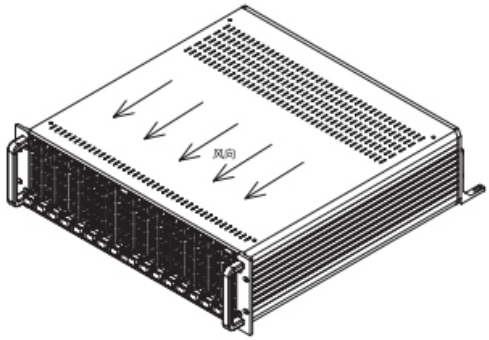
Appendix

Appendix1: Drawings

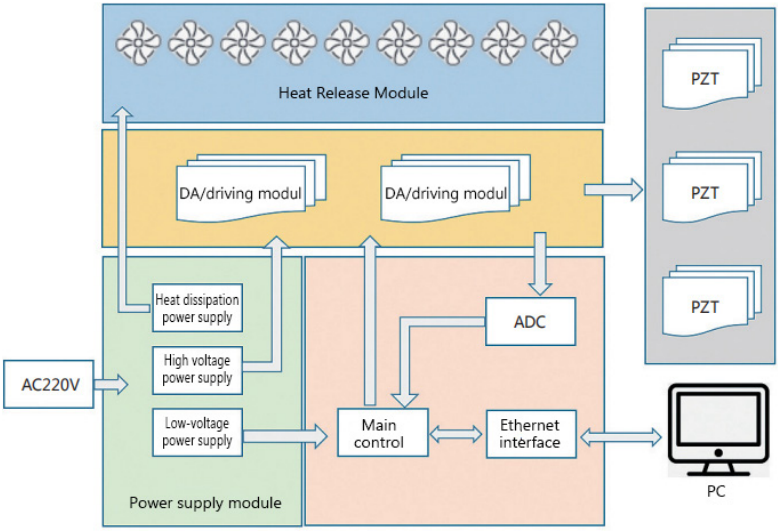








Appendix2: Block Diagram



Appendix 3: Network Communication Protocol for Piezo Actuator

▷ UDP packet structure

Data field		Type	Length(byte)	Description
1	frame header	byte	8	Seven 0xFF followed by one 0xFE
2	packet length	Uint16	2	length unit :bytes.Length = the length of bytes from the Command to CheckSum16(including CheckSUM16).
3	radix-minus-one complement	Uint16	2	=0: No confirmation required. =1: Confirmation required. =2: confirmation.
4	command	Uint16	2	
5	command	Uint16	2	
6	Data field		nb	Each command corresponds to a data area.Must be an even number of bytes and must be ≥ 2.
7	checksum16	Uint16	2	The data from the packet length to checkSUM16 is added in bytes, with the result retaining 16 bits. Image data is not validated. Checksum16 =0.

Note: All data types are stored in small - end format.The IP address of the piezo driver is 192.168.0.5 uses UDP port 7010 for transceiver.

▷ Command list

	Value		Length(byte)	Description
command=	100	connect	2	No other operation can be performed until the piezo actuator is successfully connected
	101	disconnect	2	

	110	alive	2	After the connect is successful, if AliveTest function is available, the upper computer will send at least one command to the PZT driver at least every 2 seconds,If there is no command, send alive command. If the piezo actuator does not receive at least one command within 5 seconds, it means that the upper computer has left.The piezo actuator will automatically disconnect. When the PZT driver is connected and no data can be sent, it will automatically send some alive commands. If the upper computer does not receive at least one command from the PZT driver within 5 seconds, it means that the PZT driver has been disconnected and the network needs to be checked or reconnected.
	1100	SetDriveVec		Set the drive vector.
	1101	GetDriveVec		The current drive vector returned in real - time by the driver.
	5000	String command	The length of string command	Various string commands.

▷ The command = connect

Byte offset address in the data area		Type	
0	connectParam	uint 16	The connection parameters =0: Disable AliveTest function. =1: Enable AliveTest function.

▷ Command = SetDriveVec, Set the drive vector of the piezo actuator

Byte offset address in the data area		Type	
0	DAV[0]	uint 16	the DA of no. 0 logic driving channel output
.	.		
.	.		
512	DAV[512]	uint 16	the DA of no. 256 logic driving channel output

DV: Value range =0~0xFFFF, DAV=0 output minimum drive, DAV=0xFFFF output maximum drive.The actual output of the minimum and maximum drives depends on the design of the drive.

For this drive, the minimum drive quantity =-20V, the maximum drive quantity =+120V.

The correspondence between the logical drive channel and the physical drive channel is set using string commands.

▷ Command = GetDriveVec, Set the drive vector of the piezo actuator

Byte offset address in the data area		Type	
0	DAV[0]	uint 16	the DA of no. 0 logic driving channel output
.	.		
.	.		
512	DAV[512]	uint 16	the DA of no. 256 logic driving channel output

AD: Value range =0~0xFFFF, DAV=0 output minimum drive, DAV=0xFFFF output maximum drive.The actual output of the minimum and maximum drives depends on the design of the drive.

For this drive, the minimum drive quantity =-25V, the maximum drive quantity =+125V.

The correspondence between the logical drive channel and the physical drive channel is set using string commands.

▷ Command = string command

Byte offset address in the data area		Type	Length(byte)	comment
0	String command	ASCII	The number of characters in a string command	The length of the string command varies depending on the command.When the length is less than an even number, a binary 0 is added to the end of the command to make up the even length.

Appendix 4: Piezo Actuator string command

Command format:

< address/command [: parameter]>

Address: host address. Slot address, address can be located to the specific circuit board. The host address starts at 1, and slot address 0 is the control board.

Address 1 host refers to the host directly connected to the external, the address of other cascaded hosts is increased by 1 in sequence according to the cascaded order.

Address 0.0 represents the entire drive system. For example, setting the correspondence between logical channel and physical channel is set for the entire drive system, rather than for a specific host.The setup data for the entire drive system is saved to host 1.

Command: Command string.

Parameter: The parameter format is defined by each command and there is no uniform format.Generally, "parameter name = data" is used, and the parameters are separated by commas.

All characters are case - insensitive.

Suggested command format:

Set name: set_

Read command: get_

Read the version number

The < address/get_ver >

Read the firmware version number of a circuit board.

<0.0/get_ver> means read the version number of the entire driver system.

Return: < address /get_ver:ver>

Ver: String for version number.

Set the driving voltage output range of the driver

< 0.0 / set_DriveScope: min = Vmin, Max = Vmax >

min: Lowest output voltage, signed decimal;Unit: V.

Vmax: Maximum output voltage, signed decimal;Unit: V.

//

Read the drive voltage output range

< 0.0 / get_DriveScope >

Returns: < 0.0 / get_DriveScope: min = Vmin, Max = Vmax >

Set the single-channel DA output value

< address /set_DA:CH=DAV >

CH: The drive channel number on the drive board, starting at 0.

DAV: DA output value;0 ~ 65535.

//

Reads the current DA output value of a single channel

< address /get_DA:CH >.

Return: < address /get_DA:CH=DAV >

Sets the logical channel to the physical channel

< 0.0 / set_CHMap: LogicChAddr = PhyChAddr >

LogicChAddr: Logical drive channel number, which is the driver channel number used by the user, starts at 0.

PhyChAddr: Physical drive channel, which is the actual drive channel on the circuit.0.0.0 means this logical channel is not used.

Format of physical channel address: host address.Slot address. Drive channel number on the drive board.The drive channel number on the drive board starts at 0.

//

Reads the correspondence between logical and physical channels

< 0.0 / get_CHMap: LogicChAddr >

<0.0/get_CHMap: LogicChAddr = PhyChAddr >

Set a channel misalignment coefficient

< address /set_offset: CH=offset>

Offset: Offset:0 ~ 65535.

//

read

Set the gain coefficient of a channel

< address /set_gain: CH=gain>

Gain coefficient.0 ~ 65535.

//

Read read?

Select a signal source for a drive channel

< address /set_DriveSource: CH=SignalSource>

SignalSource: the SignalSource that drives the channel.0: DAC, 1: BNC.

//

Read

Select the monitor channel

< address /set_monitor: CH >

CH: Outputs channel CH as a monitoring signal.

//

read

Enables real-time sending of the current driver vector

< 0.0 / set_GetDriveVec: en >

En: =0: not possible, =1: enabled.After enabling, the driver sends the current drive vector to the upward machine in real time

Read circuit board alarm information

< address /get_error >

Return: < address /get_error:message>

Read circuit board non-alarm information

< address /get_msg >

Return: < address/MSG :message>

Save Settings to Flash memory

< address /save >

<1.1/get_ver>

<1.2/set_DriveScope:min=0.7,max=2.5>

<1.3/get_DriveScope>

<1.4/set_DA:2=345>

<1.5/get_DA>

<1.6/set_CHMap:3=1.4.10>

<1.6/set_CHMap:6=1.7.18>

<1.6/set_CHMap:10=1.3.15>

<1.6/set_CHMap:20=21.23.25>

<1.6/set_CHMap:50=51.53.55>

<1.6/set_CHMap:70=71.73.75>

<2.8/save>

<1.7/get_CHMap:20>

<1.8/set_offset:2=567>

<1.9/get_offset>

<2.0/set_gain:2=567>

<2.1/get_gain>

<2.2/set_DriveSource:2=1>

<2.3/set_monito:4>

<2.4/get_monito>

<2.5/set_GetDriveVec>

<2.6/get_error>

<2.7/get_msg>

<2.8/save>

Appendix 5: Main technical indicators

Items	Parameter
Input voltage (V)	AC 220V
Output channel number	256 channels
Output interface	Catic photoelectric connector: J24H-74ZKH ×4 220VAC power supply connector: JY27467T13E03PN - H x 1
Single channel output voltage	-20V ~ +120V
output frequency	Square wave (50% duty cycle) not less than 1kHz @ 6.8 uF (0 to 5 v) load
Static acquisition function	Each channel can realize the voltage static acquisition function Acquisition resolution is better than 100mV
Output voltage resolution	better than 10mV
Output voltage ripple	≯ 50mV（Vpp）
Power on, power off voltage shock	≯ 5V
Communication interface	A hundred Megabyte Ethernet interface
19 inches 8U case	Volume:480mm（W）×134mm（H）×495mm（D）
Weight requirement	26kg
Short-circuit protection	Each channel has short circuit protection function
Ground resistance	Output connectors to the resistance between the "ground" Ω ≯ 1

Appendix6: Connector pin definition

J24H series miniature rectangular electrical connectors

Introduction

- Meets GJB2446
- The contact couple is the elastic strand insertion needle (braid needle) and the rigid socket, so the contact is reliable.
- Metal shielded enclosure with wire clip and quick locking device.
- Press joint, welding, straight type, bend type printed board welding various end - joint forms.
- Optional pin mounting holes for plug and socket.
- There are 9, 15, 19, 25, 26, 37, 38, 51, 52, 74 core ten specifications
- Implement enterprise standard: 21E0.204.106JT

Application

The product has the advantages of high density, light and miniaturization, which can realize the reliable interconnection of the electrical circuit system between the cable and cable inside the system, cable and printed board, and printed board and printed board.

Operating environment

The product can withstand strong vibration, impact and other harsh environment, especially suitable for use in the use of space, light equipment has special requirements.

Main technical performance

Operating temperature: -55℃ ~+125℃

Contact resistance: ≤ 9 mΩ

Relative humidity: +40℃ , up to 98%

Rated current: 5A

Vibration: 10~2000Hz, 254M /S2

Low pressure: 4KPa

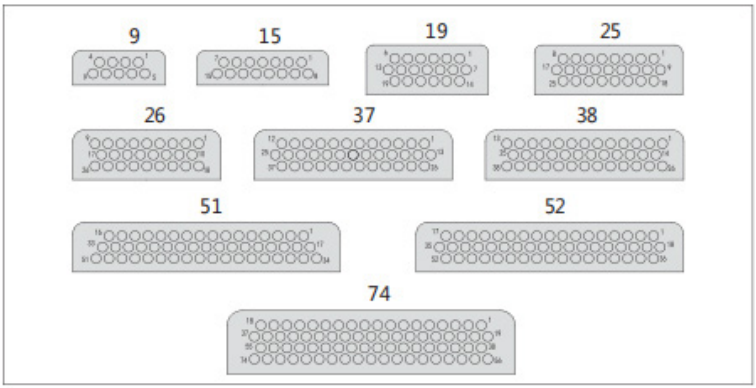
Mechanical life: 1000 times

Impact: 980 m/S2

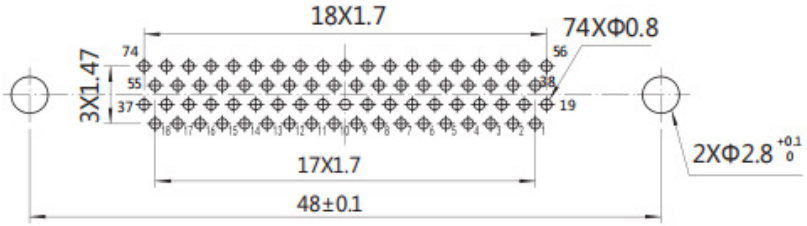
Random vibration: power spectral density 0.4G2/Hz, total added velocity RMS 23.1G

Dielectric withstand voltage: 800V (9, 19, 25, 37, 52, 74 cores) 1000V(15, 26, 38, 51 cores)

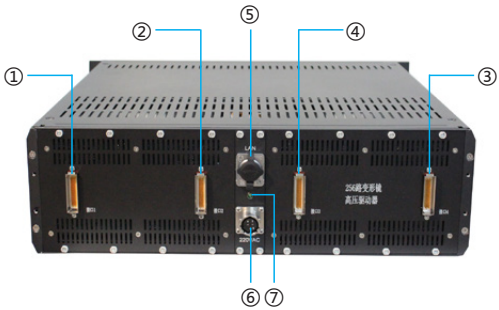
Arrangement of contacts (pin insertion surface of pin insulator)



J24H-74ZKH :



Appendix7: Connector wire sequence table



No.	Symbol	Function
1	Interface 1 Output drive (74pin connector)	Interface 1 drive output interface, CH1-CH64 output terminal.
2	Interface 2 Output drive (74pin connector)	Interface 2 drive output interface, CH65-CH128 output terminal.
3	Interface 3Output drive (74pin connector)	Interface 3drive output interface, CH129-CH192 output terminal.
4	Interface 5 Output drive (74pin connector)	Interface 4 drive output interface, CH193-CH256 output terminal.
5	Ethernet communication port LAN	The upper computer is connected with the interface module of E82.C256K through the Ethernet port access terminal to control the upper computer
6	Power 220VAC	Power connector.Connect through AC220V AC power supply.
7	POWER LED Green	Turn on the power indicator, E82.C256K is in working.

Appendix8: System composition list and vulnerable and consumable parts list

Moudle	Description	Quantity	Remark
19inches 3U height case (custom)	Volume 480mm(W)×134mm(H)×445mm(D)	1pc	
Power supply module	① High voltage power supply: +127V, -29V ② Low-voltage power supply: +3.3V, +5V, ±15V ③ Cooling part power supply: +12V	1pc	Vulnerable part
Main control and communication module	① High performance MCU STM32F743IIT6	3pcs	Including six SPI interfaces
	② Ethernet interface W5500 chip	1set	
	③ DA moduleDAC8568 DIGITal-to-analog converter	34pcs	Standby 4pcs
	④ AD acquisition output signal is directly collected by the partial voltage microcontroller, and 16 IO are extended to 256 channels through analog switch	1pc	Sampling: 10Hz/ channel
* Power amplifier module	① Voltage and power amplifier circui	256pcs	Vulnerable part
	② Heat conduction	16pcs	
	③ Fan	1set	
Output terminal	① Catic photoelectric24H-52ZKH	4pc	74pins
	② JY27467T13E03PN-H)	1pc	220V input connector