

# Chapter I IMAX Controller hardware interface

## 1.1 IMAX Controller interface description

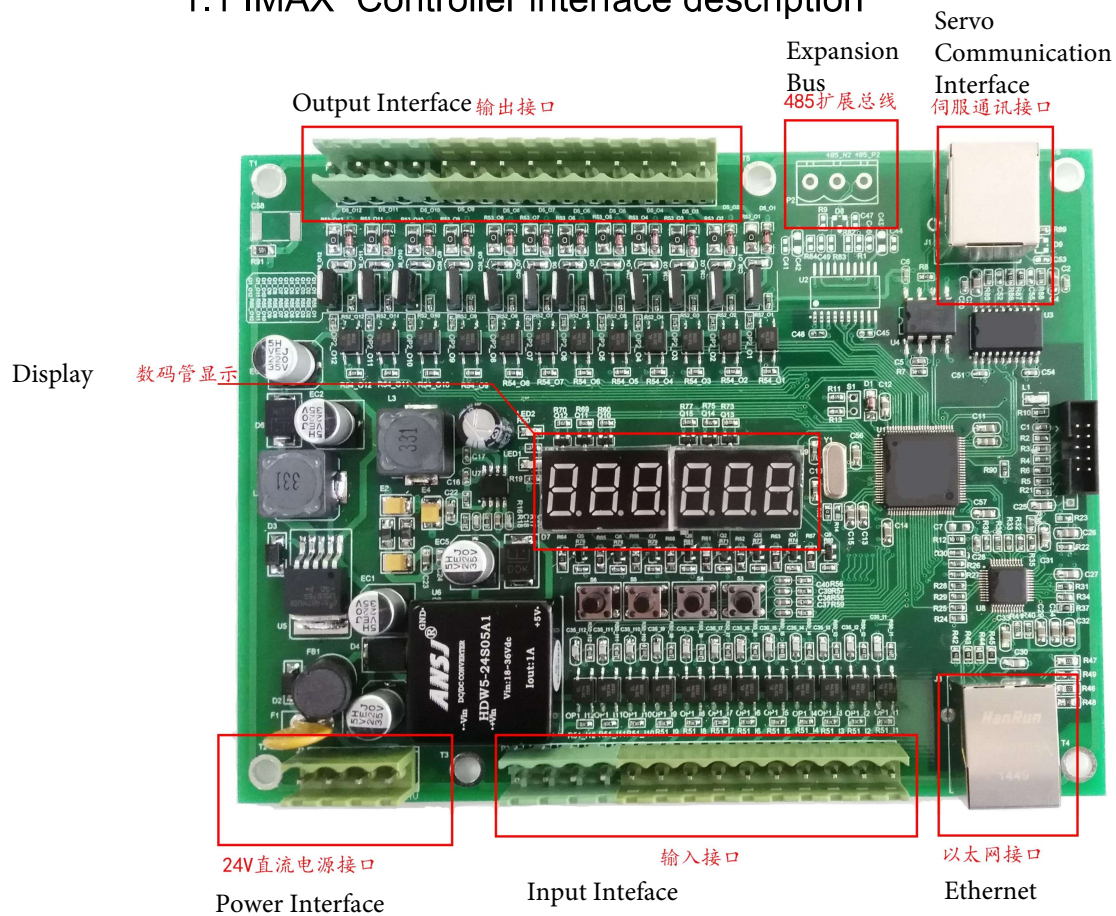


Figure 1 IMAX Controller interface description

1.2 IMAX Controller wiring

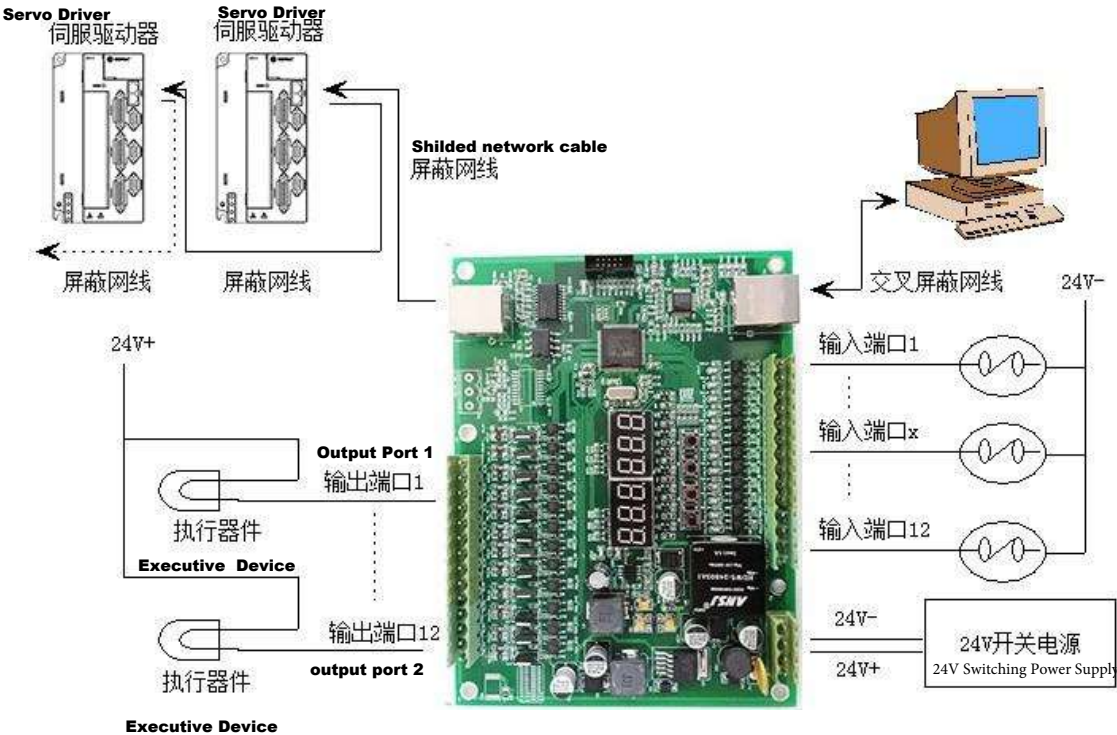


Figure 2 IMAX Wiring diagram

Chapter II Ethernet communication protocol

2.1 IMAX Overview of controller Ethernet communication

The system adopts Ethernet LAN and can/485 bus communication control scheme to realize multi axis networked servo control  
Yes. The Ethernet communication of IMAX controller adopts UDP communication protocol.

2.2 IMAX Ethernet communication protocol of controller

2.2.1 IMAX Basic framework of controller Ethernet communication

This controller adopts UDP communication protocol, and the basic format of UDP is as follows.  
By MAC address, IP address, and  
The user-defined UDP source port number and target port number realize the flow control of Ethernet data. Interactive information is reflected in UDP data part.

MAC Header (14 Bytes)									
DA			SA			TYPE			
\$. \$. \$. \$. \$. \$			\$. \$. \$. \$. \$. \$			0x0800			

IP Header (20 Bytes)									
VerHead	Diff	Total	id	Flag	TTL	Protocol	Check	Source	Destinati
Length	Services	Length		Offset		Type	Sum	IP	onIP
0x45	\$	\$. \$	\$. \$	\$. \$	\$	0x11	\$. \$	\$. \$. \$. \$. \$	\$. \$. \$. \$. \$

UDP Header (8 Bytes)			
Source Port	Destination Port	Length	CheckSum
\$. \$	\$. \$	\$. \$	\$. \$

UDP Data		
AppControlField	AppWhoField	AppDataField
\$. \$. \$. \$. \$. \$. \$. \$	\$. \$. \$. \$	\$. \$. ..... \$. \$

MAC Farne Check Sequence ( 4 Bytes)	
\$. \$. \$. \$	

The communication method of this controller can be addressed through MAC address, IP address and port number to realize point-to-point or point to multipoint. Interaction and broadcast communication. When the MAC address is 6 FF, it means physical address broadcast; When the IP segment address is 4 FF indicates logical address broadcast.

In this paper, the udpdata part of Ethernet is divided into three sub domains, which are appcontrolfield, Application handler field (appwhofield) and application data field (appdatafield)

UDP Data		
AppControlField	AppWhoField	AppDataField
\$. \$. \$. \$. \$. \$. \$. \$	\$. \$. \$. \$	\$. \$. ..... \$. \$

Application control domain (AppControlField) Used to confirm UDP data message: (ConfirmCode) , encryption (PassCode) ,Function selection(FunctionCode) ,Object channel selection(ObjectChannel) . As shown in the following table.

AppControlField			
ConfirmCode	PassCode	FunctionCode	ObjectCode
\$. \$	\$. \$	\$. \$	\$. \$

Where the application handler domain (AppWhoField) Used to indicate the receiving and response mode.

AppWhoField	
AcceptCode	ReplyCode
\$. \$	\$. \$

Acceptcode indicates the receiving method of the message. The host pair 256\*256 can be achieved by setting this data field

Interactive communication of any slave site of the matrix. When the data field is ff.ff, it means that all stations receive it; Xx.ff means XX

Train full reception; Ff.yy indicates that YY line is fully received; Xx.yy indicates (XX, YY) point reception.

Especially when this data field

When it is 00.00, it means that the message does not need to be received; The data field of the message sent by the slave station is invalid,

and it is only received by the master station.

Replycode indicates the response method of the message. After receiving the message, the slave station will judge according to the data field Whether response processing is required. When the data field is ff.ff, it means that all slave stations respond; When xx.ff, it means that the XX column is complete

answer; Ff.yy means YY line full response; Xx.yy means (XX, YY) point response. Especially when the data field is 00.00

the means that there is no need to reply after the message is received from the station.

Appdatafield refers to the data information corresponding to the function code in the application control field. IMAX

The UDP data communication function supported by the controller and the basic operation of the application data field are shown in the following table.

	master station	operation
master station	0x1101	Master read slave register operation
	0x1201	Master write slave register operation

operation	0x1301	Master station sends absolute time multi axis motion data information
	0x1401	The master station sends relative time multi axis motion data information
Slave operation	0x1001	The slave station reports the specified operation status information
	0x110x*	Slave reply register read operation
	0x120x*	Slave reply register write operation
	0x130x*	Slave station answers absolute time multi axis motion data information
	0x140x*	Slave station responds to relative time multi axis motion data information

\*Note: x = 2 indicates that the receiving operation is correct and a correct response is made;  
X = 3 indicates that the receiving operation is wrong and an incorrect response is made.

### 2.2.2 Ethernet UDP data domain description

UDP data field is the main information part of data packet, and its data format will vary according to different function codes.

#### 2.2.2.1 IMAX Control card reports specified status information

When IMAX fails during operation and requires active alarm, it will report the specified status message to the Ethernet master station Interest.

UDP Data								
AppControlField				AppWhoField		AppDataField		
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	RegStart Address	Reg Num	Reg Data
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. ..... \$
0x55aa	0x00 0x00	0x1001	0x0000	0:Host	0:None	x.x	x.x	x.....x

#### 2.2.2.2 Master station read IMAX register operation

UDP Data								
AppControlField				AppWhoField		AppDataField		
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	RegStart Address	Reg Num	Extra Data
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. ..... \$
0x55aa	0x00 0x00	0x1101	0: DPxx 1: PAxx	0:none ff.ff :all ff.yy :line xx.ff :list xx.yy:me	0:none ff.ff :all ff.yy:line xx.ff :list xx.yy:me	x.x	x.x	00.....0

#### 2.2.2.3 IMAXReturn to master station read register operation

IMAX Correct response operation

UDP Data								
AppControlField				AppWhoField		AppDataField		
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	RegStart Address	Reg Num	Reg Data
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. ..... \$
0x55aa	0x00	0x1102	0: DPxx	0:none	0:none	x.x	x.x	x.....x

	0x00		1: PAxx					
--	------	--	---------	--	--	--	--	--

IMAXError response operation

UDP Data								
AppControlField				AppWhoField		AppDataField		
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	RegStart Address	Reg Num	Error Code
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. ..... \$
0x55aa	0x00 0x00	0x1103	0: DPxx 1: PAxx	0:none	0:none	x.x	x.x	x.....x

#### 2.2.2.4 master station write IMAX register operation

UDP Data								
AppControlField				AppWhoField		AppDataField		
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	RegStart Address	Reg Num	Reg Data
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. ..... \$
0x55aa	0x00 0x00	0x1201	0: PAxx	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	x.x	x.x	x.....x

#### 2.2.2.3imax return to master station write register operation

IMAX correct response operation

UDP Data								
AppControlField				AppWhoField		AppDataField		
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	RegStart Address	Reg Num	Reg Data
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. ..... \$
0x55aa	0x00 0x00	0x1202	0: PAxx	0:none	0:none	x.x	x.x	x.....x

IMAX error response operation

UDP Data								
AppControlField				AppWhoField		AppDataField		
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	RegStart Address	Reg Num	Error Code
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. ..... \$
0x55aa	0x00 0x00	0x1203	0: PAxx	0:none	0:none	x.x	x.x	x.....x

#### 2.2.2.4 master station writes IMAX absolute time multi axis motion data

UDP Data									
AppControlField				AppWhoField		AppDataField			
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	Abs Time	Play Motor	Port Out	Play DAC
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	L*	L*.L*	L*	L*
0x55aa	0x00 0x00	0x1301	0: 3axis 1: 6axis x*: xaxis	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	Absolute time	Absolute position of corresponding haft motor	Output port status	DAC data output

#### 2.2.2.5imax returns to the master station and writes absolute time multi axis motion data

IMAX correct response operation

UDP Data									
AppControlField				AppWhoField		AppDataField			
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	Abs Time	Play Motor	Port Out	Play DAC
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	L*	L*L*	L*	L*
0x55aa	0x00 0x00	0x1302	0: 3axis 1: 6axis x*: xaxis	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	Absolute time	Absolute position of corresponding haft motor		DAC data output

IMAX error response operation

UDP Data									
AppControlField				AppWhoField		AppDataField			
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	Abs Time	Play Motor	Port Out	Play DAC
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	L*	L...L	L*	L*
0x55aa	0x00 0x00	0x1303	0: 3axis 1: 6axis x*: xaxis	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me				

#### 2.2.2.6 master station writes IMAX absolute time multi axis motion data

UDP Data									
AppControlField				AppWhoField		AppDataField			
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	Rela Time	Play Motor	Port Out	Play DAC

\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	L	L....L	L	L
0x55aa	0x00 0x00	0x1401	0: 3axis 1: 6axis x*: xaxis	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me				

\*Note L represents 4 bytes in length, with a total of 32 bits

2.2.2.7imax returns to the master station and writes absolute time multi axis motion data

IMAX correct response operation

UDP Data									
AppControlField				AppWhoField		AppDataField			
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	RelaT ime	Play Moto r	Port Out	Play DAC
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	L	L....L	L	L
0x55aa	0x00 0x00	0x1402	0: 3axis 1: 6axis x*: xaxis	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me				

IMAX error response operation

UDP Data									
AppControlField				AppWhoField		AppDataField			
Confirm Code	Pass Code	Function Code	Object Channel	Accept Code	Reply Coce	Rela Time	Play Motor	Port Out	Play DAC
\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	\$. \$	L*	L...L	L	L*
0x55aa	0x00 0x00	0x1403	0: 3axis 1: 6axis x*: xaxis	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	0:none ff.ff :all ff.yy :line xx.ff :color xx.yy:me	Relative time	Absolute state of corresponding shaft motor	Input port status	

\*Note L refers to 4-byte data length

## 2.3Description of controller parameters

IMAX controller parameters are divided into PA parameters and DP parameters; DP parameter is used for monitoring and scanning, and it is not guaranteed after power failure  
Save, the master can only read but not write. PA parameters are the working parameters of the controller. Some of them are saved after power failure, and the master station can be written and readable.  
Both PA and DP parameters are 32-bit data, and the addresses are 0x00 to 0xff.

### 2.3.1 PA Parameter description

IMAX Operating parameters of controller		
Parameter name	explain	Default value

PA 00	Mode setting: 0:485 working mode; 1: Manual test mode; 2: Test mode 10: can working mode, 11: can input / output working mode, 12: test mode	0
PA 01	Indicates UDP resolution mode,	0
PA 02	Number of working servo motors: X is the number greater than 0	3
PA 03	Rotation axis No.: 0: no rotation axis, x:x axis is rotation axis	0
PA 04	Input 1 to 32 signal selection: 0: normal, 1: negative	1
PA 05	Output 1 to 32 signal selection: 0: normal, 1: negative	0
PA 06	Fast forward enable: 0: send all received data; 1: If there are more than 2 data in the cache, the fast forward function is automatically enabled.	1
PA 07	Maximum speed limit of motor operation	3000
PA 08	Manual reset	0
PA 09	When there is no time parameter instruction, the time interval parameter.	100
PA 0a	Time resolution method (0: use packet time, 1: use UDP receiving time)	0
PA 0b	Time data maximum limit	3000
PA 0c	Reset mode setting in can mode (0: custom mode, 1: Torque return to zero)	1
PA 0d	Not used yet	0
PA 0e	The upper computer controls the reset mode (0: reset, 1: return to the zero position)	0
PA 0f	Parameter initialization settings (used when the network cable is not connected)	0

IMAX controller UDP communication		
Parameter name	explain	Default value
PA 10	Controller IP address a:0 to 255	192
PA 11	Controller IP address b:0 to 255	168
PA 12	Controller IP address c:0 to 255	15
PA 13	Controller IP address d:0 to 255	201
PA 14	Controller communication port (local port number)	7408
PA 15	UDP reply enable	1
PA 16	Mac code 1	0
PA 17	Mac code 2	0
PA 18	Mac code3	0
PA 19	Mac code4	0
PA 1a	Mac code5	0
PA 1b	Mac code6	0
PA 1c	Not used yet	0
PA 1d	Not used yet	0
PA 1e	Not used yet	0
PA 1f	Not used yet	0

UDP communication master station setting parameters		
Parameter name	explain	Default value
PA 20	Master IP address a	192
PA 21	Master IP address B	168
PA 22	Master IP address C	15



PA 23	Master IP address D	101
PA 24	Master port number	8410
PA 25	Not used yet	0
PA 26	Not used yet	0
PA 27	Not used yet	0
PA 28	Not used yet	0
PA 29	Not used yet	0
PA 2a	Not used yet	0
PA 2b	Not used yet	0
PA 2c	Not used yet	0
PA 2d	Not used yet	0
PA 2e	Not used yet	0
PA 2f	Not used yet	0

Servo related parameters			value
Parameter name	explain	Default	
PA 30	Setting of lowering torque of axis a (torque when finding zero point)	47	
PA 31	Setting of lowering torque of axis B (torque when finding zero point)	47	
PA 32	Setting of lowering torque of axis C (torque when finding zero point)	47	
PA 33	Setting of descending torque of axis U (torque when finding zero point)	47	
PA 34	Setting of descending torque of axis V (torque when finding zero point)	47	
PA 35	Setting of lowering torque of axis w (torque when finding zero point)	47	
PA 36	Not used yet	0	
PA 37	Not used yet	0	
PA 38	Not used yet	0	
PA 39	Not used yet	0	
PA 3a	Not used yet	0	
PA 3b	Not used yet	0	
PA 3c	Custom change method	0	
PA 3d	Control card start delay time	1000	
PA 3e	Maximum zero finding distance (circle) under 485 communication mode	60	
PA 3f	Reset speed under 485 communication mode (adjust the parameter value of servo pa775 under can mode)	100	

Relevant parameters of electric cylinder		
Parameter name	explain	
PA 40	Rising distance after zero point finding (0.1mm)	100
PA 41	Pitch of electric cylinder (0.1mm)	50
PA 42	Maximum stroke of electric cylinder (0.1mm)	0
PA 43	When pa40=0, the safety height of the first axle (0.1mm)	0
PA 44	When pa40=0, the safety height of the second axis (0.1mm)	0
PA 45	When pa40=0, the safety height of the third axis (0.1mm)	0
PA 46	When pa40=0, the safety height of the fourth axle (0.1mm)	0
PA 47	When pa40=0, the safety height of the fifth axis (0.1mm)	0

PA 48	When pa40=0, the safety height of the sixth axis (0.1mm)	0
PA 49	Not used yet	0
PA 4a	Not used yet	0
PA 4b	Not used yet	0
PA 4c	Not used yet	0
PA 4d	Not used yet	0
PA 4e	Not used yet	0
PA 4f	Not used yet	0
Command filtering related parameters		
Parameter name	explain	
PA 50	Position command filtering time threshold (MS)	100
PA 51	The exponential filtering depth (0-7) should be set to 0 in the case of negative position	4
PA 52	Position error compensation coefficient (0: no compensation, 1: maximum compensation, 2:0.5 compensation, 3:0.25 compensation)	0
PA 53	Not used yet	0
PA 54	Not used yet	0
PA 55	Not used yet	0
PA 56	Not used yet	0
PA 57	Not used yet	0
PA 58	Not used yet	0
PA 59	Not used yet	0
PA 5a	Not used yet	0
PA 5b	Not used yet	0
PA 5c	Not used yet	0
PA 5d	Not used yet	0
PA 5e	Not used yet	0
PA 5f	Not used yet	0

Relevant parameters of safety switch		
Parameter name	explain	
PA 90	0x01: safety function enable +0x02: inching function enable +0x04: inching function enable	0
PA 91	0: keep still, and continue to move to the next position after stopping and releasing. 1. Return to zero point and move to the next position after the stop is released. 2. Keep still and return to zero point only after receiving reset.	0
PA 92	Safety shutdown input IO port (for example, if X1 and X3 are used, it is set to 5)	0
PA 93	Input X-port filtering time parameter	200
PA 94	Safety speed limit when the alarm is released	0
PA 95	Axis serial number deviation	0
PA 96	Click in function IO selection, (invalid if it is repeated with PA92)	0
PA 97	Click back function IO rotation (invalid if repeated with PA92)	0
PA 98	Not used yet	0
PA 99	Not used yet	0

PA 9a	Not used yet	0
PA 9b	Not used yet	0
PA 9c	Not used yet	0
PA 9d	Not used yet	0
PA 9e	Manual I0 output setting	0
PA 9f	Output I0 initial value setting	0

Command filtering related parameters		
Parameter name	explain	
PA F0	Not used yet	100
PA F1	Not used yet	4
PA F2	Not used yet	0
PA F3	Not used yet	0
PA F4	Not used yet	0
PA F5	Not used yet	0
PA F6	Not used yet	0
PA F7	Not used yet	0
PA F8	Not used yet	0
PA F9	Not used yet	0
PA Fa	Not used yet	0
PA Fb	Not used yet	0
PA Fc	Not used yet	0
PA Fd	Not used yet	0
PA Fe	Not used yet	0
PA Ff	Not used yet	0

### 2.3.3 DPParameter description

UDP Communication master station setting parameters		
Parameter name	explain	
DP 00	Working speed of axis 1	
DP 01	Working speed of axis 2	
DP 02	Working speed of axis 3	
DP 03	Not used yet	
DP 04	Not used yet	
DP 05	Not used yet	
DP 06	16 bits high for axis 1 position	
DP 07	16 lower bits of axis 1 position	
DP 08	16 bits high in axis 2 position	
DP 09	16 lower bits of axis 2 position	
DP 0a	16 bits high in axis 3 position	
DP 0b	Lower 16 bits of axis 3 position	
DP 0c	Not used yet	

DP 0d	Not used yet
DP 0e	Not used yet
DP 0f	Not used yet
DP 1B	Working speed of axis 4
DP 1C	Working speed of axis 5
DP 1D	Working speed of axis 6
DP 21	16 bits high in axis 4 position
DP 22	Lower 16 bits of axis 4 position
DP 23	16 bits high in axis 5 position
DP 24	Lower 16 bits of axis 5 position
DP 25	16 bits high in axis 6 position
DP 26	16 lower bits of axis 6 position
DP 53	
DP 54	
DP 55	
DP 49	UDP data cache read pointer
DP 48	UDP data cache write pointer
DP 5E	Digital input logic
DP 66	Digital output logic
DP 80	Axis 1 position deviation
DP 81	Axis 2 position deviation
DP 83	Axis 3 position deviation
DP F0	Control register
DP F1	Digital output logic setting register
DP F5	Current working axis number
DP F6	UDP packet receiving interval
DP FE	Servo driver alarm type
DP FF	Software version number

## Chapter III parameter setting and modification

The nixie tube point is facing down, and the buttons from left to right are mod key, left shift key, increase key and set key.

1. Steps for setting PA parameters:

- 1) Power on nixie tube cycle jump display;
- 2) Press the mod key until the nixie tube displays paxx, where X represents hexadecimal digits 0 to f;
- 3) Press the move left and add keys to modify XX to the desired parameter;
- 4) Press the set key to enter the parameter setting;
- 5) You can see that the nixie tube displays a number between 0 and 999999;

- 6) Press the move left and increase keys to modify the parameter to the desired value;
  - 7) Press the set key to set and exit to paxx;
  - 8) Press the mod key to display eeop on the nixie tube;
  - 9) Long press the set key to change the nixie tube from eeop to cycle jump display, and the parameters are saved successfully.
2. Steps to query DP parameters:
- 1) Power on nixie tube cycle jump display;
  - 2) Press mod key to display dpxx on the nixie tube, where X represents a hexadecimal number 0 to f;
  - 3) Press the move left and add keys to modify XX to the desired parameter;
  - 4) Press the set key to enter the parameter display. The digital tube displays the DP parameter.
3. Parameter saving steps
- 1) Power on nixie tube cycle jump display;
  - 2) Press mod key to eeop display;
  - 3) Long press the set key to make the nixie tube enter the cycle jump display state, and the parameters are saved successfully.

## Chapter IV Ethernet debugging

### 4.1 IMAX Connection between controller and computer

IMAX controller and computer need to communicate through LAN. Therefore, LAN setting is required first. Set. Click computer control panel -> network and Sharing Center -> change adapter control -> local connection. Right click the attribute and pop up

Out of the local connection property setting dialog box.

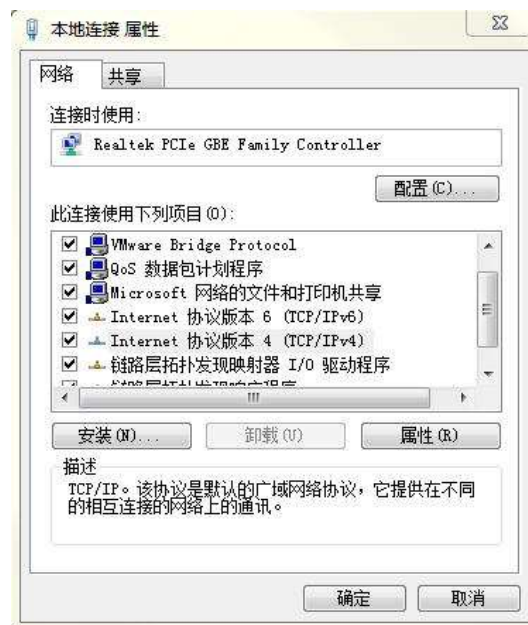


Figure 3 local connection attribute settings

Select Internet Protocol version 4 (tcp/ipv4), and click properties to pop up the property setting dialog box

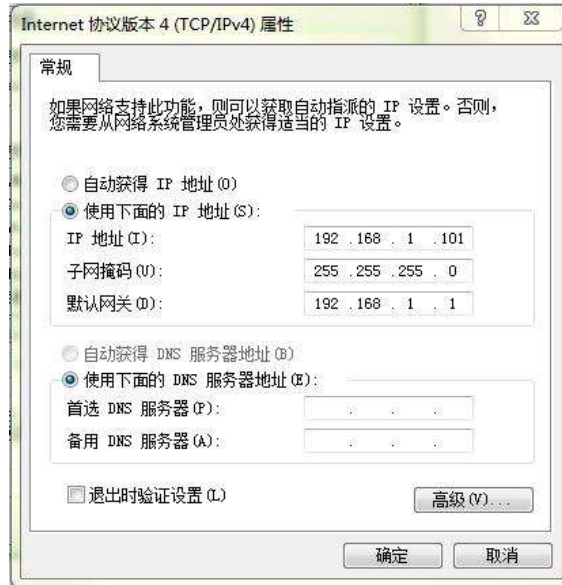


Figure 4 IP address setting of master station

Set the local IP address and default gateway, and click OK to exit the setting.

After setting the IP address of the computer master station, you also need to set the IP address of the IMAX controller. According to the ground IP address sets the parameter values from PA20 to pa23 of IMAX controller.

If the IP address is as shown in the above figure, IMAX control The brake should be set as shown in the following table.

parameter	PA 20	PA 21	PA 22	PA 23
Set value	192	168	1	101

After setting the master IP parameters of IMAX controller, you also need to set its own IP address of IMAX controller. by For the convenience of networking, the IP address of the IMAX controller should be in the same network segment as the IP address of the computer master station. As shown in the following table.

parameter	PA 10	PA 11	PA 12	PA 13
Set value	192	168	1	201

After the setting is completed, the connection test can be carried out through the ping command. The test results are shown below.

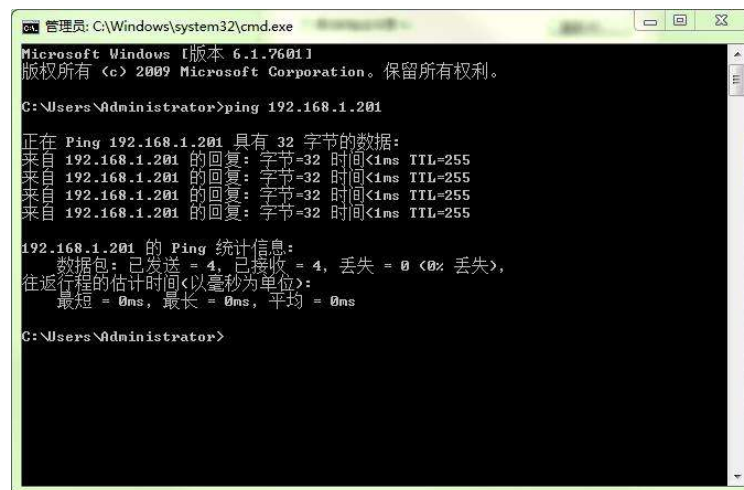


Figure 5 Ping connection test diagram

## 3.2 IMAX Communication test and packet capturing experiment between controller and master station

After IMAX control is connected with the master station, simple data can be sent through MATLAB software for action test.

Open Wireshark software, select local connection, and click start to enter the monitoring interface. As shown in the following figure.



Figure 6wireshark software startup monitoring

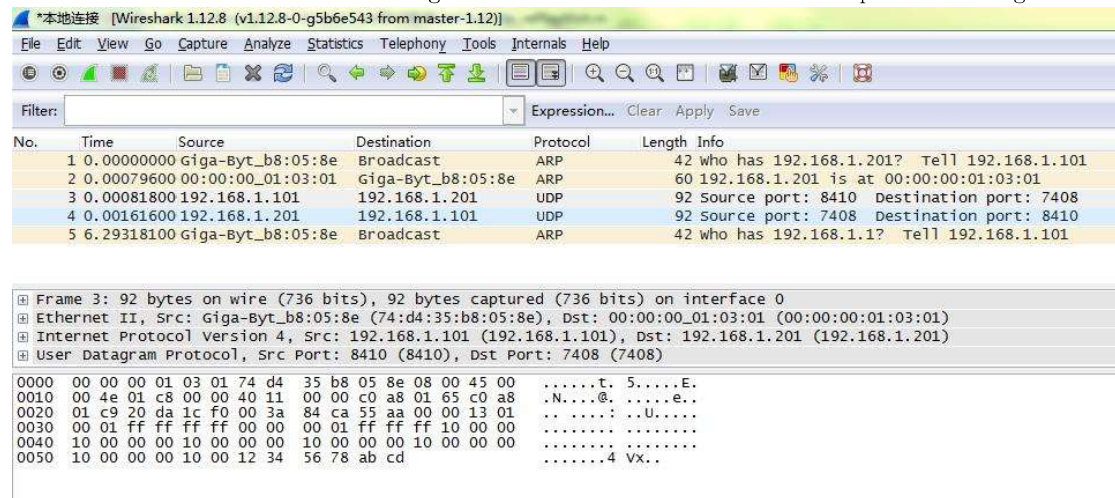


Figure 7wireshark software capture

Open the MATLAB software, click open, select the test m file, set the slave address and click Run In the Wireshark interface, you can see the UDP data sent by the master station and the data returned by the slave station.

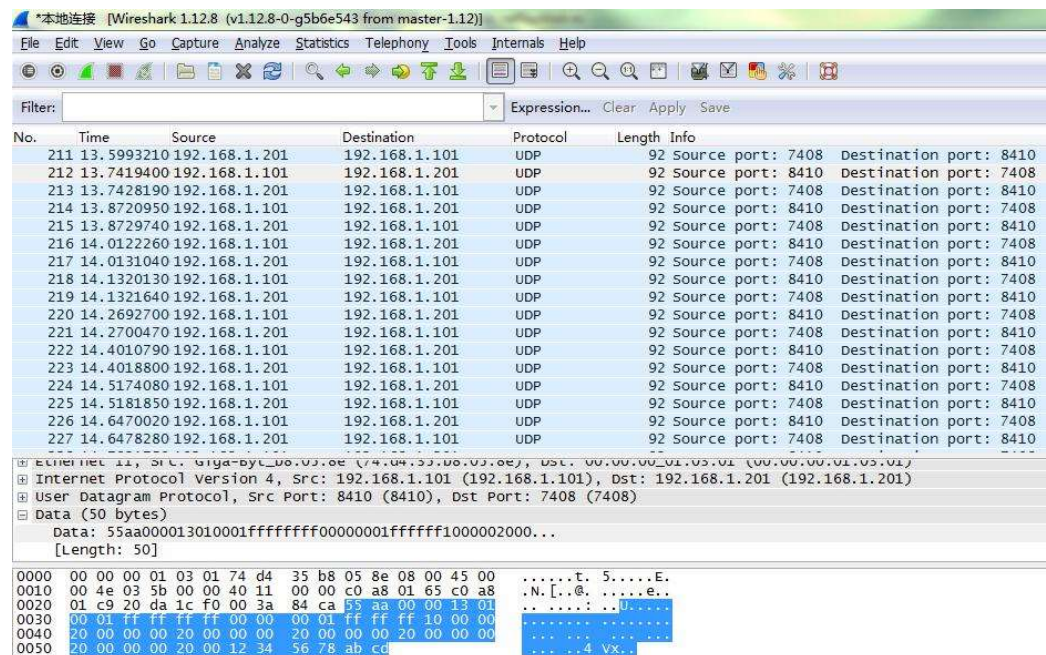


Figure 8 master station sends IMAX controller to receive data packets



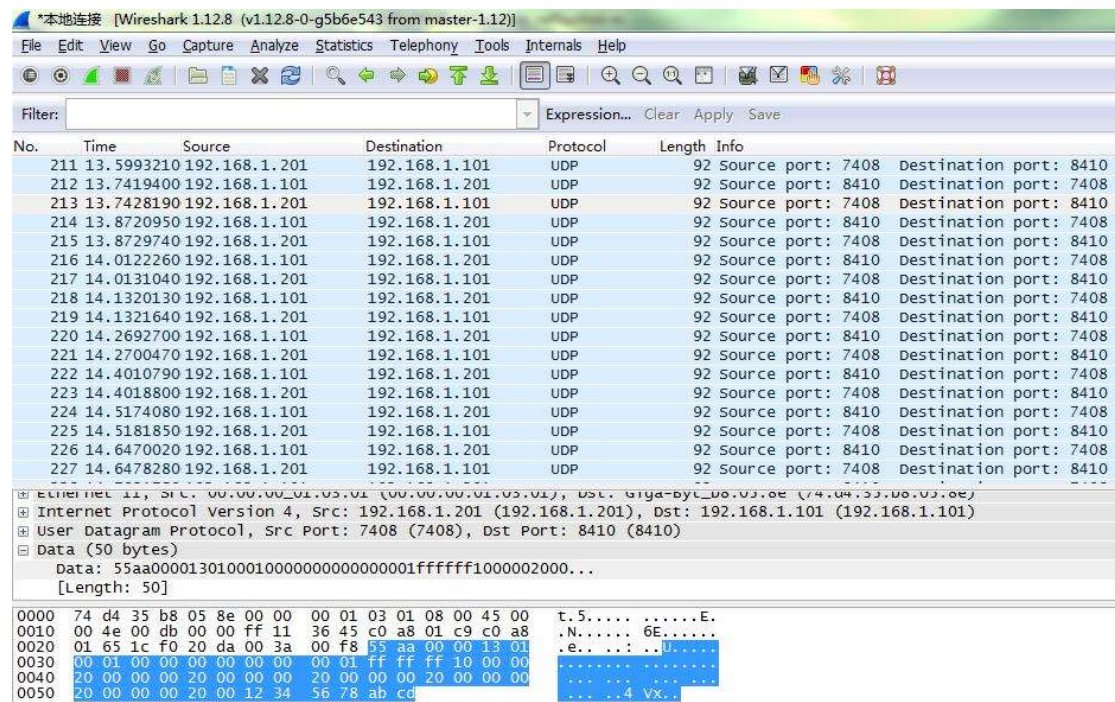


Figure 9imax controller return data

## Chapter V installation and commissioning instructions

Several parameters that should be paid attention to when installing and debugging IMAX controller.

### 5.1 IP address of network connection

IMAX controller UDP communication	
Parameter name	explain
PA 10	Controller IP address a:0 to 255
PA 11	Controller IP address b:0 to 255
PA 12	Controller IP address c:0 to 255
PA 13	Controller IP address d:0 to 255
PA 14	Controller communication port (local port number)
PA 15	UDP reply enable

The IP address of Leke's playback platform is 192.168.15.201:7408; Therefore, the parameter is set to PA10=192; PA11=168; PA12=15; PA13=201; PA14=7408.

Leke's playback platform does not need to send UDP packets, so pa15 can be set to 0, so UDP response is prohibited OK.

UDP communication master station setting parameters	
Parameter name	explain
PA 20	Master IP address a
PA 21	Master IP address B
PA 22	Master IP address C



PA 23	Master IP address D
PA 24	Master port number

To realize the return of UDP packets, it is necessary to correctly set the master station IP address, such as the master station IP of Leke's playback platform 192.168.15.101:8410; Therefore, the parameter is set to pa20=192; PA21=168; PA22=15; PA23=101; PA24=8410;

## 5.2 control mode of IMAX controller

IMAX controller operating parameters	
Parameter	name explain
PA 00	Working mode setting: 0: working mode; 1: Manual test mode; 2: Test mode
PA 02	Number of working servo motors: X is the number greater than 0
PA 03	Rotation axis No.: 0: no rotation axis, x:x axis is rotation axis
PA 07	Maximum speed limit
PA 08	Manual reset
PA 09	Fixed time interval parameter without time parameter
PA 0a	Time value mode setting (0: get the time code in the control instruction, 1: get the UDP packet time interval)
PA 0b	Maximum command time setting
PA 0c	Reset mode setting (0: user-defined reset mode, 1: torque reset mode)
PA 0f	Parameter initialization settings (used when the network cable is not connected)

To make the controller work normally, pa00=0 must be guaranteed in 485 mode and pa00=10 in can mode;  
The number of IMAX controller control axes needs to be set according to different applications, for example, the animation seat with 2 seats is composed of 3  
Pa02=3 for three electric cylinders, or pa02=4 for three seat 9D animation seats controlled by four electric cylinders;  
Some animation seats need to have the function of rotation, such as the three seat 9D animation seat. At this time, you need to

PA03 is set according to the data position. Generally, the last group of data is used as the rotation axis data in the data format, for example, in 3

On the 9D animation seat of seat, pa03=4;

In order to protect the servo and avoid the servo alarm, a software protection is needed at this time. Generally, the servo motor is the largest

When the speed is 3000 rpm, pa07 should be set to 3000;

When it is necessary to manually reset the electric lever, pa08 can be set to 1, and then IMAX control will control

The servo motor is reset, and pa08 is automatically reset to 0 after reset.

Some players do not have absolute time or relative time when playing data. At this time, a fixed time interval needs to be set. Separate parameters to ensure that each action data can be completed on time. For example, the player wants 100ms to be a UDP packet

Pa09 can be set to 100.

The first time maximum value setting is used to limit the size of UDP packet time value. When the time value is greater than pa0b Value, the value of pa0b will be taken as the time value.

When pa0f is set to 1, the parameter initialization operation will be carried out and initialized to the default value.

This operation requires that the network cable is not connected

When it is used, it will be automatically cleared after initialization. After query initialization, it needs to be powered on again to work normally.

## 5.4 setting of zero return torque

Parameter name	explain
PA 30	Setting of lowering torque of axis a (torque when finding zero point)
PA 31	Setting of lowering torque of axis B (torque when finding zero point)
PA 32	Setting of lowering torque of axis C (torque when finding zero point)
PA 33	Setting of descending torque of axis U (torque when finding zero point)
PA 34	Setting of descending torque of axis V (torque when finding zero point)

<b>PA 35</b>	Setting of lowering torque of axis w (torque when finding zero point)
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When the electric cylinder returns to zero, it can use the way of additional sensors or through torque control to find the zero position. When using force

When the torque control method is used to zero, the torque during zero can be set by setting the parameters pa30 to pa35. one

Generally, when considering the load, the torque value is between 35 and 47. When reset and change occurs, an electric cylinder does not return

To the bottom, consider increasing the PA parameter of the corresponding axis.

## 5.5 rise protection distance setting

Relevant parameters of electric cylinder	
Parameter name	explain
<b>PA 40</b>	Rising distance after zero point finding (0.1mm)
<b>PA 41</b>	Pitch of electric cylinder (0.1mm)

After the electric cylinder returns to zero, there is a rising process to protect the seat from touching the bottom during movement. Pa40 and can be set

Pa41 parameter to adjust the rising distance. For example, when the pitch of the electric rod is 5mm and the desired rise distance is 10mm, you can

Pa40=100, pa41=50. At this time, after the electric bar finds the zero position, the servo motor will rotate for 2 turns (pa40 divided by pa41

The obtained value) makes the electric cylinder rise 10mm.

## 5.6 safety belt and emergency stop function:

Safety belt function related parameters	
Parameter name	explain
<b>PA 04</b>	Input I0 signal selection (0: high level is valid, 1: low level is valid), When the switch is not connected after power on, the input I0 is at high level
<b>PA 90</b>	<b>Safety belt function setting 0x01</b>
<b>PA 91</b>	Safe parking mode: 0: keep still, and continue to move to the next position after stopping and releasing. 1. Return to zero point and move to the next position after the stop is released. 2. Keep still and return to zero only after receiving the reset command.
<b>PA 92</b>	Safety shutdown input I0 port (for example, if X1 and X3 are used, it is set to 5)
<b>PA 93</b>	Input X-port filtering time parameter
<b>PA 94</b>	Speed limit when safe parking is released

It is recommended to use the normally open switch as the button for the safety belt and emergency stop function.

1. If you want to use X01 port and normally open switch to realize the emergency stop function, the platform will not move until the switch is pressed down

When the machine sends out reset, it realizes safe reset. Parameters can be set as follows

PA 04	1
PA 90	0x01
PA 91	2
PA 92	1
PA 93	default
PA 94	default

2. If we want to use X01 and X02 as seat belt functions to realize that the platform moves when a seat belt is fastened, two Return to zero when the safety belts are disengaged. Only one safety belt can work normally.

First, select the normally closed switch as the safety belt switch. And set parameters as follows

PA 04	1
PA 90	0x01

PA 91	1
PA 92	0x01+0x02 = 3
PA 93	default
PA 94	default

## 5.7 rotating platform Description:

Relevant parameters	
Parameter name	explain
<b>PA 03</b>	Rotation axis serial number setting, (refers to the axis with the current position as zero)
<b>PA 40</b>	Rising distance after zero point finding (0.1mm)
<b>PA 41</b>	Pitch of electric cylinder (0.1mm)
<b>PA 42</b>	Maximum stroke of electric cylinder (0.1mm)
<b>PA 50</b>	Position command filtering time threshold (MS)
<b>PA 51</b>	Exponential filtering depth (0-7)

If it is necessary to reset an axis with the current position as zero, the value of PA03 can be set as the serial number of the axis.

If you need to achieve 360 degree rotation, or when the zero point is in the middle, you need to set pa51 to 0, shielding index

Filtering, in this case, the position of 100 is 0x00000064, and the position of -100 is 0xffff9c.

The zero offset set by pa40, pa41... Is to reserve a safe position for the normal operation of the motor

Position of 0x00000000 of machine control command = mechanical zero position +pa40/pa41 (zero offset position) + servo driver zero

Point return position (pa777 parameter of the drive).

## 5.8 Instruction filtering description

Relevant parameters	
Parameter name	explain
<b>PA 50</b>	Position command filtering time threshold (MS)
<b>PA 51</b>	Exponential filtering depth (0-7)
<b>PA 52</b>	Position error compensation coefficient (0: no compensation, 1: maximum compensation, 2:1/2 compensation, 3:1/4 compensation)

The exponential filter is used inside the control card to smooth the position instructions sent by the upper computer, and the smoothing depth is determined by pa51

Set, 0: do not use exponential filter, 1: do not smooth, 2-7: use exponential filter to smooth, the greater the value, the better the smoothing effect

The better. The recommended value is 4. When there is a negative position value, pa51 should be set to 0.

Pa52 is used to adjust the deviation between the servo driver and the command position. The larger the compensation is, the more accurate the servo control position is,

But the continuity of action will decrease. It is recommended that pa52 be set to 5.

## 5.9 Customize the setting of change method

Relevant parameters	
Parameter name	explain
<b>PA 0c</b>	Change method setting (0: custom change, 1: torque limit change)
<b>PA 3c</b>	Customize the setting of zero adjustment method (0: torque zero adjustment method, 1: sensor zero adjustment)

In 485 mode, the limit sensor mode and torque limit mode are effective at the same time, and do not need to be set.

In can mode, the origin sensor mode and torque limit mode are not effective at the same time, and pa0c and pa3c need to be set

Make a selection. If the platform is composed of 4 axes, and you want the 1st and 3rd axes to use the sensor mode, you should set

PA0c=0; PA3c=5 (0x01+0x04) ;

5.10 axis serial number deviation setting

PA 95	Axis serial number deviation	0
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If it is necessary to realize an instruction to control two control cards to perform actions at the same time, and these two control cards take  
For the data of different axes, you need to set the parameter pa95, which is 0 by default. If pa95 is set to 6, this control  
The first axis of business card printing takes the position value of the 7th axis in the command.

Chapter VI abnormal display

Description of abnormal operation of control card  
The following display will be provided when the control card detects abnormal communication and data processing

Display value	explain
Err 0	Not used yet
Err 1	The communication with servo shaft 1 is abnormal, and it is cleared after the communication connection is normal
Err 2	The communication with servo shaft 2 is abnormal, and it is cleared after the communication connection is normal
Err 3	The communication with servo axis 3 is abnormal, and it is cleared after the communication connection is normal
Err 4	The communication with servo axis 4 is abnormal, and it is cleared after the communication connection is normal
Err 5	The communication with servo axis 5 is abnormal, and it is cleared after the communication connection is normal
Err 6	The communication with servo shaft 6 is abnormal, and it is cleared after the communication connection is normal
Err7	Servo is abnormal, and the selected servo model does not match
Err 10	Servo axis 1 alarm, re power on and clear, servo alarm detected
Err 11	Servo axis 2 alarm, re power on and clear, servo alarm detected
Err 12	Servo axis 3 alarm, re power on and clear, servo alarm detected
Err13	Servo axis 4 alarm, re power on and clear, servo alarm detected
Err14	Servo axis 5 alarm, re power on and clear, servo alarm detected
Err15	Servo axis 6 alarms, power on again to clear, and servo alarm is detected
Err17	If the initial playback time is too long, power on again or reset and clear (this alarm will be sent when pa0d=0)
Err 20	UDP memory overflows, UDP communication is abnormal, and it will be cleared automatically after normal communication
Err21	UDP data cache overflow, caused by abnormal playback. Power on again or reset and clear
