DTS Acquisition Card

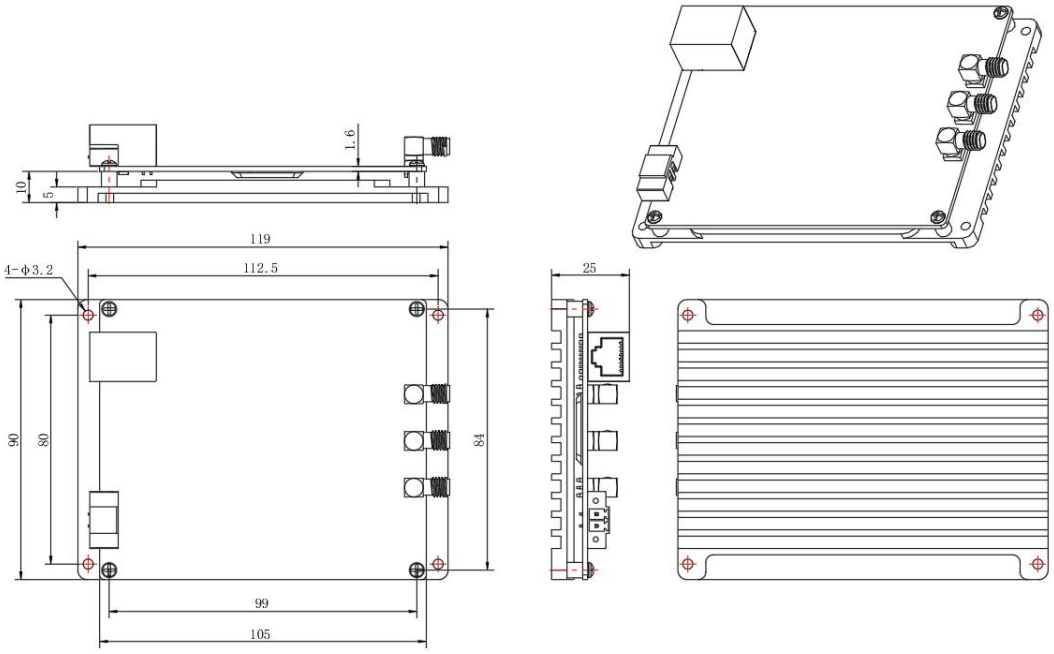
1、Overview

DTS-ETH-250M-2 is a special data acquisition card for DTS of distributed fibre optic temperature measurement system, which adopts Gigabit Ethernet port for data transmission and built-in averaging function with very high signal-to-noise ratio. Each channel supports a maximum of 32768 points of acquisition, averaging up to 65536 times, 250M sampling rate, spatial resolution of 0.4 metres.

2、specification

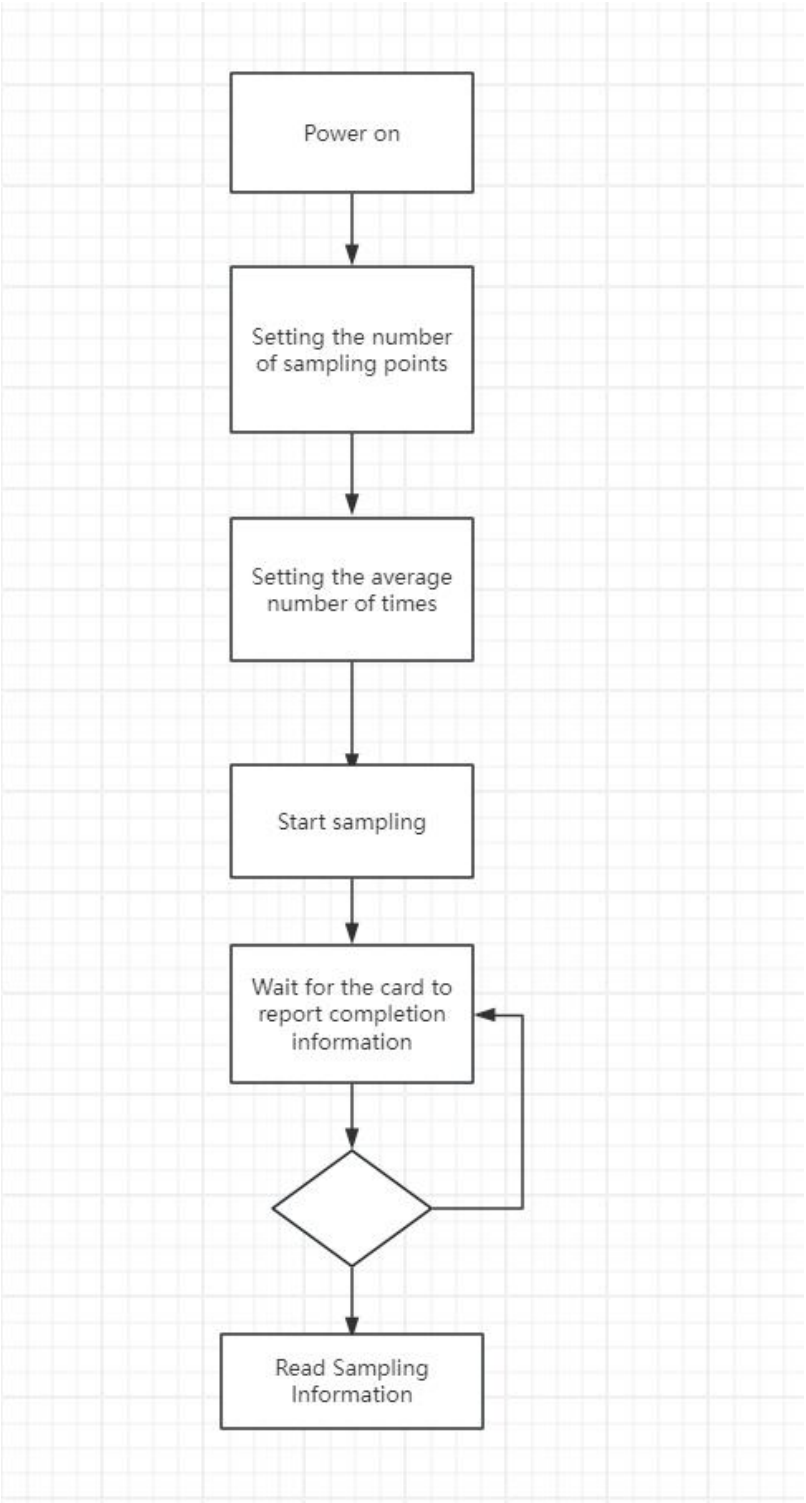
- 12-bit dual-channel synchronous real-time acquisition
- 250M sample rate
- Trigger input sampling (TTL 3.3-5V)
- DC coupled, 50 ohm input impedance
- ±2.0V input range (customisable)
- Gigabit Ethernet port, UDP protocol
- supports 32768 point samples per channel
- Maximum 65536 averaging times
- 12V/0.6A power supply
- Operating temperature range: -20~60°C

3、Mechanical (unit: mm)



4、workflow

UDP communication is used, the IP of the acquisition card is 192.168.137.2, the port is 8028, the small-end data format is used, the default number of sampling points is 16384, the average number of times is 30000, and the workflow is shown in the following figure.



5、Agreement format

Set/query command format:

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	Fixed to 0x21 0x41 0x32 0x10 for checking data frame start position
2	Data frame number	uint32_t	4	This is used to indicate the sequence number of the data frame, the same sequence number will be used when the capture card responds.
3	Answer IP address	uint8_t	4	Used to specify the IP address to which the answer data of the capture card is sent, for example, if the answer IP address is 192.168.137.2, the answer data of the capture card will be sent to the host with IP address 192.168.137.2.
4	Answer port	uint16_t	2	Used to specify the port to which the answer data of the capture card is sent, for example, if the answer IP address is 192.168.137.2 and the answer port is 20000, the answer data of the capture card will be sent to port 20000 of the host with IP address 192.168.137.2.
5	Command	uint16_t	2	Currently supported commands: 0x0001：Query the version number of capture card 0x0002：Set the sampling points of capture card 0x0003：Query the acquisition card sampling point number 0x0004：Set capture card average number of times 0x0009：Query capture card average number of times 0x000A：Start the capture card to start sampling 0x000B：Query the sampling status of capture card 0x000C：Force capture card to stop sampling 0x000D：Read A channel data 0x000E：Read B channel data
6	Payload	-	-	Determined by specific orders

Response command format:

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	Fixed to 0x21 0x41 0x32 0x10 for checking data frame start position
2	Data frame number	uint32_t	4	The serial number of the data frame, when the card answers, it will use the same serial number of the data frame as the setup/query command it answers.
3	Answer IP address	uint8_t	4	Consistent with the contents of the same field in the setup/query command being answered
4	Answer port	uint16_t	2	Consistent with the contents of the same field in the setup/query command being answered
5	Command	uint16_t	2	with the command in the setup/query command that is answered or on 0x8000, e.g., the original command is 0x0001, and the command when answered is 0x8001
6	Payload	-	-	Determined by specific orders

1） Capture card version number

Send ：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x0001

respondent ：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x8001
6	Version number	uint8_t	4	The answer data for the current version is 0x01 0x02 0x03 0x04

Send：
0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x20 0x4e 0x01 0x00

respondent：
0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x20 0x4e 0x01 0x80 0x01 0x02 0x03 0x04

2) Setting the number of sampling points of the acquisition card

Send：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x0002
6	Sampling Points	uint16_t	2	value range 1-32768

respondent：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x8002
6	Setting Result	uint8_t	1	Success: 0x00; Failure: 0x01

Send：
0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x02 0x00 0x00 0x08
respondent：
0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x02 0x80 0x00

3) Query the sampling points of the acquisition card

Send：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x0003
6	Sampling Points	uint16_t	2	

Respondent：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x8003
6	Sampling Points	uint16_t	2	

Send：

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x03 0x00

Respondent：

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x03 0x80 0x00 0x08

4) **Setting the average number of acquisition card samples**

Send：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x0004
6	Average number of times	uint16_t	2	value range 1-65535

Respondent：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x8004
6	Setting Result	uint8_t	1	Success: 0x00; Failure: 0x01

Send：

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x04 0x00 0x10

Respondent：

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x04 0x80 0x00

5) Query the average number of samples taken by the acquisition card

Send：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x0009

respondent：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x8009
6	Average number of times	uint32_t	4	

Send：

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x09 0x00

Respondent：

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x09 0x80 0x00 0x01 0x00 0x00

6） Setting the capture card to start sampling

Send：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x000A

Respondent：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x800A
6	Setting Result	uint8_t	1	Success: 0x00; Failure: 0x01

Send：

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x0A 0x00

Respondent：

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x0A 0x80 0x00

7) Query Capture Card Capture Status

Send：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x000B

Respondent：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x800B
6	Sampling status	uint8_t	1	Completed: 0x00; Sampling: 0x01

Send：
0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x0B 0x00
Respondent：
0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x0B 0x80 0x00

8) Force the card to stop sampling

Send：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x000C

Respondent：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x800C
6	Setting Result	uint8_t	1	Success: 0x00; Failure: 0x01

Send：
0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x0C 0x00
Respondent：
0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x0C 0x80 0x00

9) Read acquisition card sampling data

Send：

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x000D/0x000E
6	Starting address	uint16_t	2	
7	Read Points	uint16_t	2	To avoid being packetized after exceeding the MTU, the length of a single read is no more than 512 dots and is a multiple of 4

Respondent:

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x800D/0x800E
6	Sampling point data	int16_t	N	A sample point data is int16_t and the voltage conversion formula is: Voltage = (sample point data / 16384)* 2

Send:

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x0D 0x00 0x00 0x00 0x20 0x00

Respondent:

0x21 0x41 0x32 0x10 0x00 0x00 0x00 0x00 0x03 0x89 0xa8 0xc0 0x21 0x4e 0x0D 0x80 0x00 0x00 0x00 0x00 .....

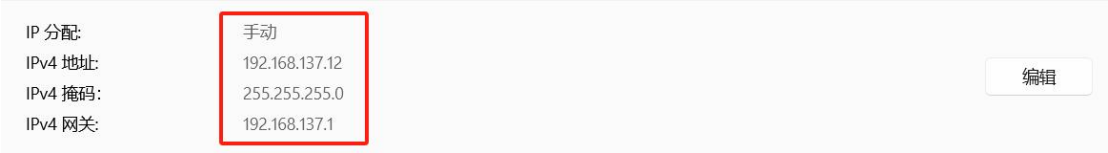
10) Capture card actively reports completion status after completion of capture

Capture card active send:

Serial number	Field name	Data type	Number of bytes	Remarks
1	Header	uint8_t	4	0x21 0x41 0x32 0x10
2	Data frame number	uint32_t	4	
3	Answer IP address	uint8_t	4	
4	Answer port	uint16_t	2	
5	Command	uint16_t	2	0x000F
6	Status of the command	uint8_t	1	0x00

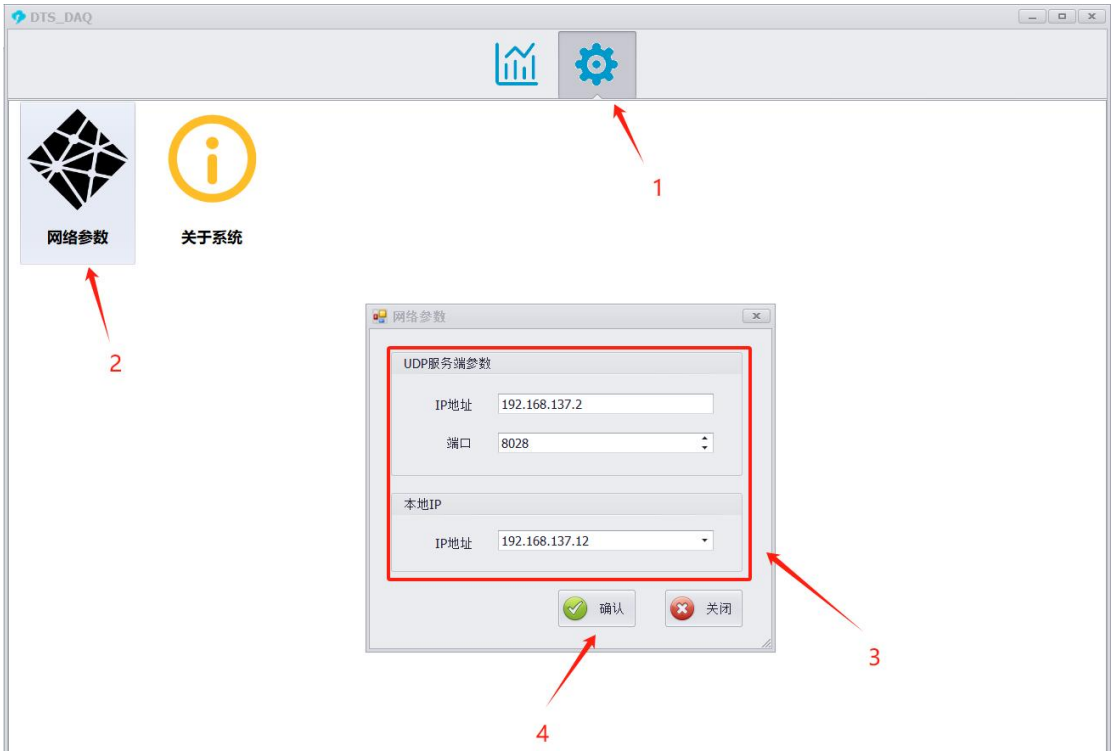
6、Demonstration software example

1) Connect the acquisition card and computer with a gigabit network cable, connect 12V power supply to the acquisition card, and connect the trigger signal and the analog signal to be acquired, configure the IP of the computer to the network segment of the acquisition card, as shown in the following figure:

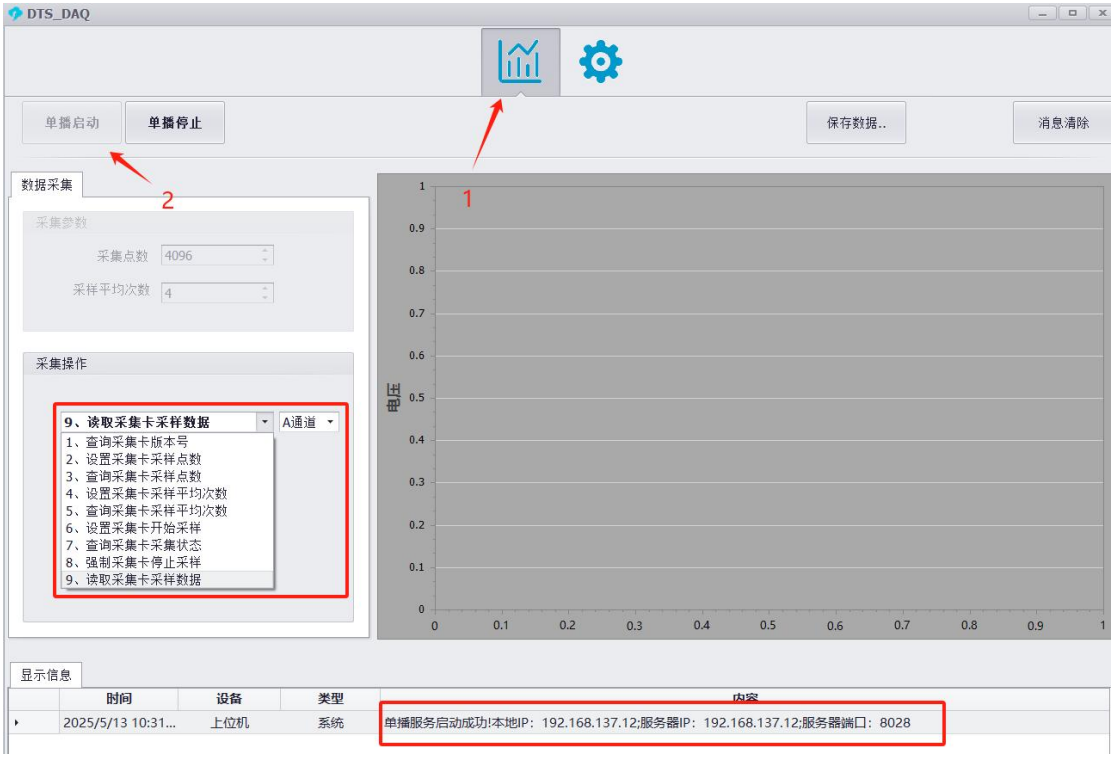


2) Double-click “DTS_DAQ.exe” to open the demo software, click the “Settings” icon, double-click the “Network Parameters”, configure the network parameters, and finally click the “Confirm” button to save. “Confirm” button to save,

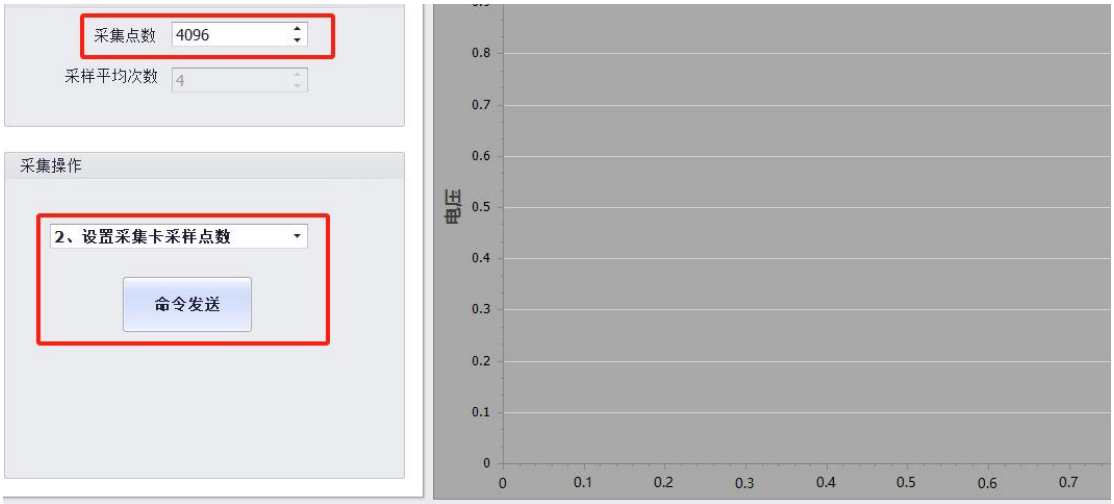
as shown below:



Click the "Curve" icon, click the "Unicast Start" button to establish a connection with the capture card, as shown below:



According to the above workflow, set the number of sampling points to 4096 and the average number of times to 10000, respectively, and start sampling

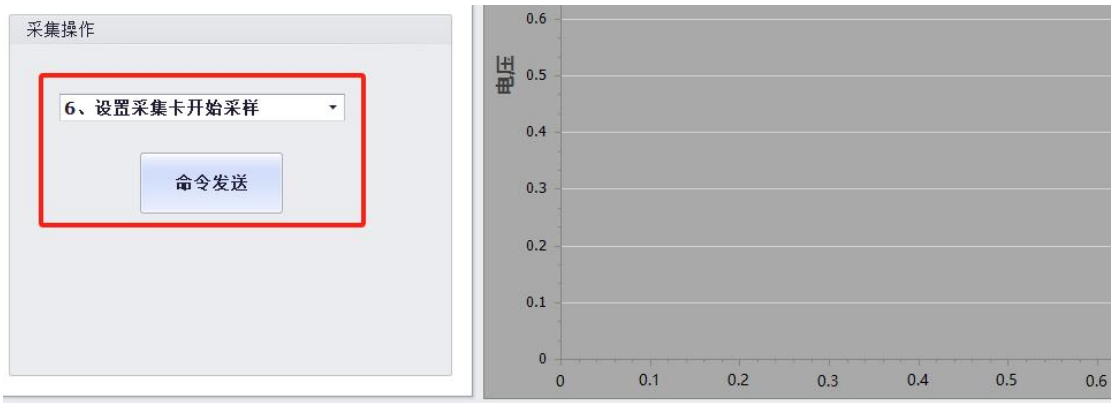


显示信息

	时间	设备	类型	内容
	2025/5/13 10:31...	上位机	系统	单播服务启动成功!本地IP：192.168.137.12;服务器IP：192.168.137.12;服务器端口：8028
	2025/5/13 10:35...	上位机	下发	发送采集卡采样点数设置命令...
	2025/5/13 10:35...	上位机	下发	数据发送=>(长度:18):21 41 32 10 00 00 00 00 0C 89 A8 C0 C2 FD 02 00 00 10
	2025/5/13 10:35...	采集卡	回复	信息回复<=(长度:17)21 41 32 10 00 00 00 00 0C 89 A8 C0 C2 FD 02 80 00
	2025/5/13 10:35...	采集卡	回复	设置采集卡采样点数成功!

显示信息

	时间	设备	类型	内容
	2025/5/13 10:3...	采集卡	回复	信息回复<=(长度:17)21 41 32 10 00 00 00 00 0C 89 A8 C0 C2 FD 04 80 00
	2025/5/13 10:3...	采集卡	回复	设置采样平均次数成功!
	2025/5/13 10:3...	上位机	下发	发送采集卡采样平均次数设置命令...
	2025/5/13 10:3...	上位机	下发	数据发送=>(长度:18):21 41 32 10 00 00 00 00 0C 89 A8 C0 C2 FD 04 00 10 27
	2025/5/13 10:3...	采集卡	回复	信息回复<=(长度:17)21 41 32 10 00 00 00 00 0C 89 A8 C0 C2 FD 04 80 00
▸	2025/5/13 10:3...	采集卡	回复	设置采样平均次数成功!



显示信息

	时间	设备	类型	内容
	2025/5/13 10:3...	上位机	下发	发送采集卡开始采样命令设置...
	2025/5/13 10:3...	上位机	下发	数据发送=>(长度:16):21 41 32 10 00 00 00 00 0C 89 A8 C0 C2 FD 0A 00
	2025/5/13 10:3...	采集卡	回复	信息回复<=(长度:17)21 41 32 10 00 00 00 00 0C 89 A8 C0 C2 FD 0A 80 00
	2025/5/13 10:3...	采集卡	回复	设置采集卡开始采样成功!
	2025/5/13 10:3...	采集卡	回复	信息回复<=(长度:17)21 41 32 10 00 00 00 00 0C 89 A8 C0 C2 FD 0F 80 00
	2025/5/13 10:3...	采集卡	回复	采集卡采集状态:已完成。

3) Reading data