GY-DAQ-2480-E/OE

Dual-channel Ethernet High-speed Acquisition Card

Communication Protocol

Version 1.0

Version Change Description

serial number	change contents	remark
1		
2		
3		
4		

October 2025

1. Summarize

GY-DAQ-2480-E/OE is a DAS full demodulation acquisition card based on network interface launched by Guilin Guangyi, with dual-channel 250MSps synchronous trigger sampling. As a network interface DAS high-speed data acquisition card, it uses Gigabit Ethernet or 10G optical port to communicate with the host computer. By adopting large-capacity data buffer and high-speed data transmission engine technology, it supports real-time upload of original data and demodulated data. The data transmission rate can reach 1000Mb/s, and the sampling optical port transmission can reach 10Gb/s. The acquisition card adopts dual-channel 14-bit high-speed ADC with sampling rate of 250MSps and supports DAS data acquisition of more than 100km. Built-in phase demodulation algorithm, can directly upload amplitude phase demodulation data, phase data can be directly used by users as vibration signals, without demodulation processing again, to achieve full cable demodulation; or upload the original sampling data for users to demodulate.

Compared with the traditional IQ demodulation acquisition card, the acquisition card has a built-in phase demodulation algorithm module, which realizes coherent fading suppression and global demodulation, greatly improves the accuracy and stability of demodulated signals, and lays a foundation for subsequent signal processing and identification. It avoids the user still need to unwrap the operation after getting the data, reduces the system's requirements for CPU computing power, and also greatly reduces the user's development difficulty, realizing the simple operation of data reading and phase vibration.

specifications

- 14bits dual channel synchronous real-time sampling
- 250MSps sampling rate
- DC coupling, 50Ω input impedance
- 2Vpp input voltage range
- Up to 60dBc SFDR
- Trigger output pulse
- Gigabit Ethernet or 10G optical port high-speed transmission interface optional
- Built-in coherent fading suppression demodulation algorithm

Power supply and power consumption

- Power supply:12V, 3A
- Power consumption: 12W (Max)

Temperature range

- Operating temperature:-20 ~70 ℃

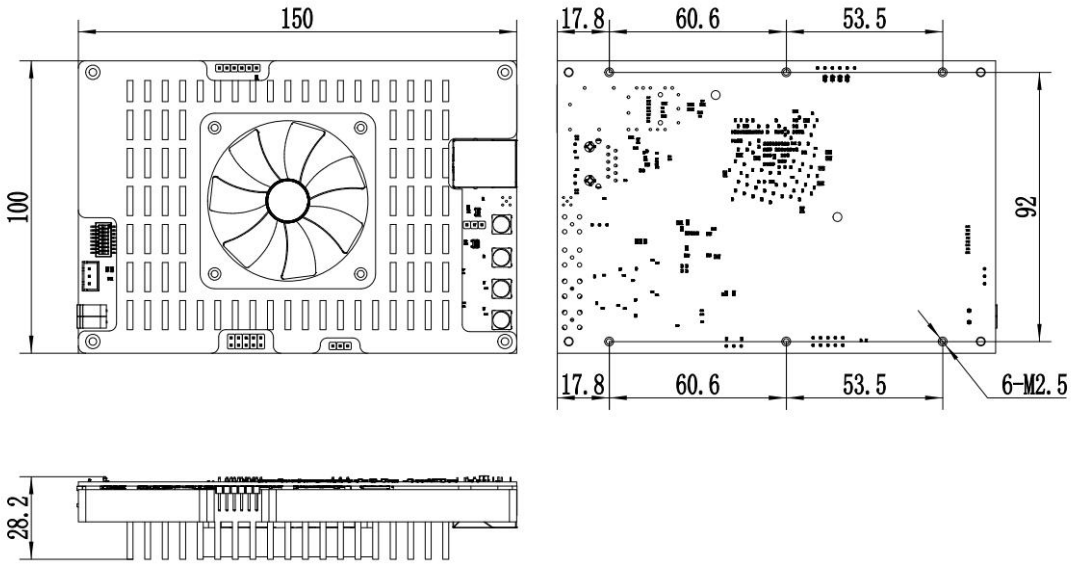
■ Storage temperature:-40 ° C ~ 85 ° C

Mechanical size

■ 150mm(L)x100mm(W)x28.2mm(D)

2. Interface Definition

- Gigabit Ethernet interface: for data transmission and parameter setting
- 10G optical port: used for data transmission and parameter setting
- Ch1: Acquisition channel 1
- Ch2: Acquisition Channel 2
- Trig-in: External trigger, 3.3V input
- Trigger-out: Internal acquisition trigger output, 3.3V/5V optional



interface definition

3. IP Address

The acquisition card uses UDP transmission protocol to communicate with the host computer. Before communication, the host computer needs to set IP address and port according to the following parameters:

FPGA IP: 192.168.137.2 Port: 6789

PC IP:192.168.137. 3Data port: 6788, Command port: 6787

Data and commands are received through separate ports for convenient processing by the host computer.

4. UDP Message Format

4.1. PC to FPGA(transmit, transmit port: 6789)

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data
0xA55AAA5555AA	0x0001: Send command 0x0002: Read Data	Send according to section 4 command instructions	Length of data to be sent	retain	data to be sent

Each time PC sends a command to FPGA, FPGA will return the query result of the corresponding command. If no query result command is returned, it is considered that sending the command fails. When programming, a timeout reception can be made. If sending the command fails, it can be retransmitted once.

Example 1 (setting the number of samples to 1024):

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0002	0x00000008	0x0000	0x0000000000000400 (1024)

Example 2 (query sample count):

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0002	0x0002	0x00000008	0x0000	0x0000000000000000

4.2. FPGA to PC

4.2.1. Receive command queryresult (receive port: 6787)

FH (frame header) (6 bytes)	function (2 bytes)	retain (2 bytes)	data length (2 bytes)	data	
				order (2 bytes)	result (2 bytes)
0x5AA555AAAA55	0x0002	0x0001	data length	query command	search result

Example (query sample count results):

FH (frame header) (6 bytes)	function (2 bytes)	retain (2 bytes)	data length (2 bytes)	data	
				order (2 bytes)	result (2 bytes)
0x5AA555AAAA55	0x0002	0x0001	0x0004	0x0002	0x1000

4.2.2. Receive sample data (receive port: 6788)

FH (frame header) (6 bytes)	function (2 bytes)	retain (2 bytes)	data flag (2 bytes)	packet sequence number (2 bytes)	packet length (2 bytes)	data
0x5AA555AAAA55	0x0003	0x0000	0x0011: Normal data 0x1100: End of data	Current UDP packet sequence number, which can be used to determine packet loss (starting from 1, sequence +1)	packet length (Max. 1424+ 16)	sample data（int16）

Data Description: The sampling data is stored in short int format. One sampling point occupies 2 bytes. A UDP packet uploads 1424 Bytes of sampling data at most, i.e. 712 sampling points. When the number of sampling points is greater than 712 sampling points, a group of pulse-triggered sampling data will be divided into multiple UDP packets for uploading. The packet flag is distinguished by the data flag. When the 0x1100 flag is detected, it indicates that a group of complete sampling data is sampled, and whether packet loss occurs is judged by the packet serial number. The packet serial number sequence is increased by 1.

For example, if the number of sampling points is 2 000, then the total number of dual-channel original data, single-channel amplitude phase data or dual-channel phase data is 4000 (refer to Section 5.7 Data Type), then one trigger sampling will be divided into 4000/712= 5.618 ≈ 6 UDP messages to upload, the packet number starts from 1, the data length of the first 5 messages is 1424 Bytes (7 12 sampling points), the data flag bit is 0x0011, the packet number is 1 - 5, the data length of the last message is 880 Bytes (440 sampling points), the data flag bit is 0x1100, the packet number is 6, and the subsequent trigger sampling is the same as above. Therefore, a complete trigger sampling will be composed of 6 UDP messages, and after receiving a complete trigger sampling frame data, it can be used for subsequent application processing.

5. Command Description

5.1. Start/ End Command (0x0001)

Definition: Start or stop sampling. After starting sampling, the sampled data will be uploaded continuously, and stopping sampling will end the uploading of data.

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0001	0x00000008	0x0000	0x 00000000000001: Start acquisition 0 x 000000000000: Stop collection

5.2. Sample Length (0x0002)

Definition: Number of data points triggered by one pulse sampling,multiple of 256 bits required, default value: 4096, maximum value: 32768

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0002	0x00000008	0x0000	0x0000000000001000

5.3. Samplingdelay points (0x0010)

Definition: sampling points delayed after trigger pulse rising edge, default value: 100

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0010	0x00000008	0x0000	0x0000000000000064

5.4. Pulse frequency (0x0004)

Definition: Trigger output pulse frequency sent by sampling card, default value: 2000

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0004	0x00000008	0x0000	0x00000000000007D0

5.5. Pulse Width (0x0011)

Definition: Trigger output pulse width (ns) emitted by sampling card, default value: 100, pulse width minimum 4ns, step 4ns, no maximum limit.

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0011	0x00000008	0x0000	0x0000000000000064

5.6. Set demodulation gauge (0x0034)

Definition: Set demodulation scale, multiply sampling resolution to obtain spatial resolution of corresponding Das system, default value: 16, step 1, maximum value: 32.

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0034	0x00000008	0x0000	0x0000000000000010: Gauge 16

5.7. Set data type (0x0008)

Definition: Select the data type uploaded by the acquisition card, including raw data, single-channel amplitude phase data and dual-channel phase data.

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0008	0x00000008	0x0000	0x0000000000000001：original data 0x0000000000000002：Channel 1 amplitude phase data 0x0000000000000003：Dual channel phase data

Data types corresponding to different settings

serial number	setting value	Upload Data Type	parsing rules
1	1	Dual channel raw data	ch1_data,ch2_data,ch1_data,ch2_data……
2	2	Channel 1 Amplitude Phase Data	|amplitude 1| Phase 1| amplitude 1| Phase 1|……
3	3	Dual channel phase data	|Phase 1| Phase 2| Phase 1| Phase 2|……

The original data and phase data are parsed as signed 16-bit integers (short), and the amplitude data is parsed as unsigned 16-bit integers (short); the phase datais signed 16-bit integers (short), which need to be divided by 512.0to be normalized to floating point numbers to correspond to radians. The phase data has been demodulated by all optical fibers and can be directly used as vibration data (audio data) for subsequent application development.

5.8. Set sampling resolution (0x00 26)

Definition: Set the sampling resolution of the acquisition card, that is, the fiber

length corresponding to one sampling point. The sampling resolution determines the upload signal rate. The larger the resolution, the smaller the upload signal rate and the smaller the amount of uploaded data. Multiplication of the total number of sampling points equals the length of the monitored optical cable.

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0021	0x00000008	0x0000	0x0000000000000000: 0.4m 0x0000000000000001: 0.8m 0x0000000000000002: 1.6m 0x0000000000000003: 3.2m 0x0000000000000004: 6.4m

Note: The resolution here is approximate resolution, and the fiber refractive index n is calculated as 1.5. If you need to accurately calculate the length of the cable, you need to use the actual fiber refractive index for conversion, that is, the actual resolution =1.5/nr* resolution, nr is the actual fiber refractive index used, usually 1.467.

5.9. Bias Voltage Setting (0x0023)

Definition: Sets the ADC sampling offset voltage. Default value: 0. Configurable range: ±1000 mV. 0 mV corresponds to 0 offset, 1000 mV corresponds to +1 V offset, and -1000 mV corresponds to -1 V offset.

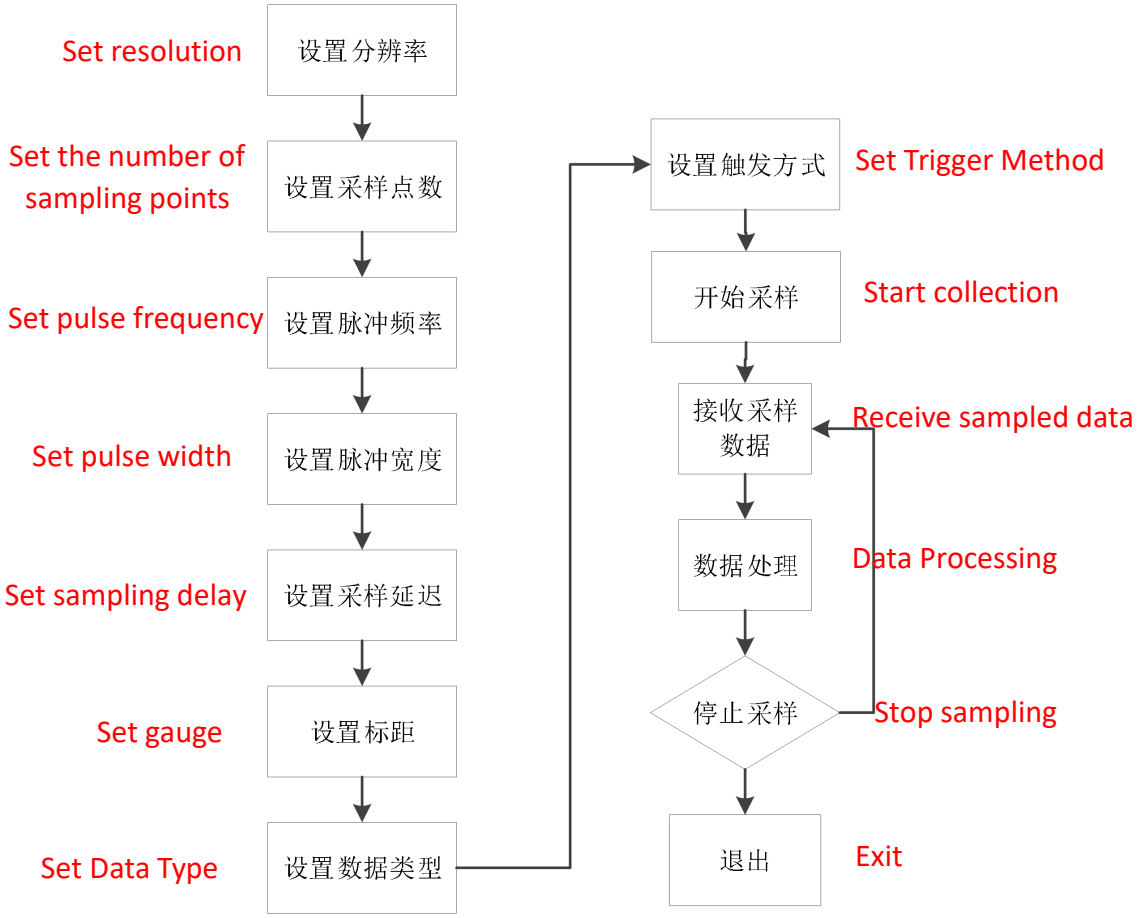
FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0023	0x00000008	0x0000	0x0000000000000000

5.10. Set trigger selection (0x0025)

Definition: Set ADC sampling trigger type, default internal trigger, 0 is internal trigger, 1 is external trigger.

FH (frame header) (6 bytes)	function (2 bytes)	order (2 bytes)	data length (4 bytes)	standby application (2 bytes)	data (8 bytes)
0xA55AAA5555AA	0x0001	0x0025	0x00000008	0x0000	0x0000000000000000: interior 0x 00000000001: External

6. Acquisition Card Calling Process:

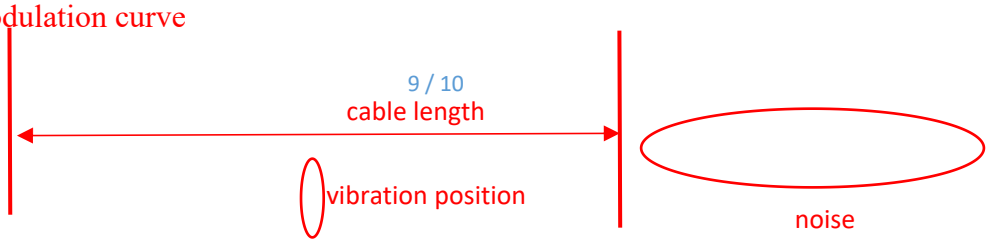


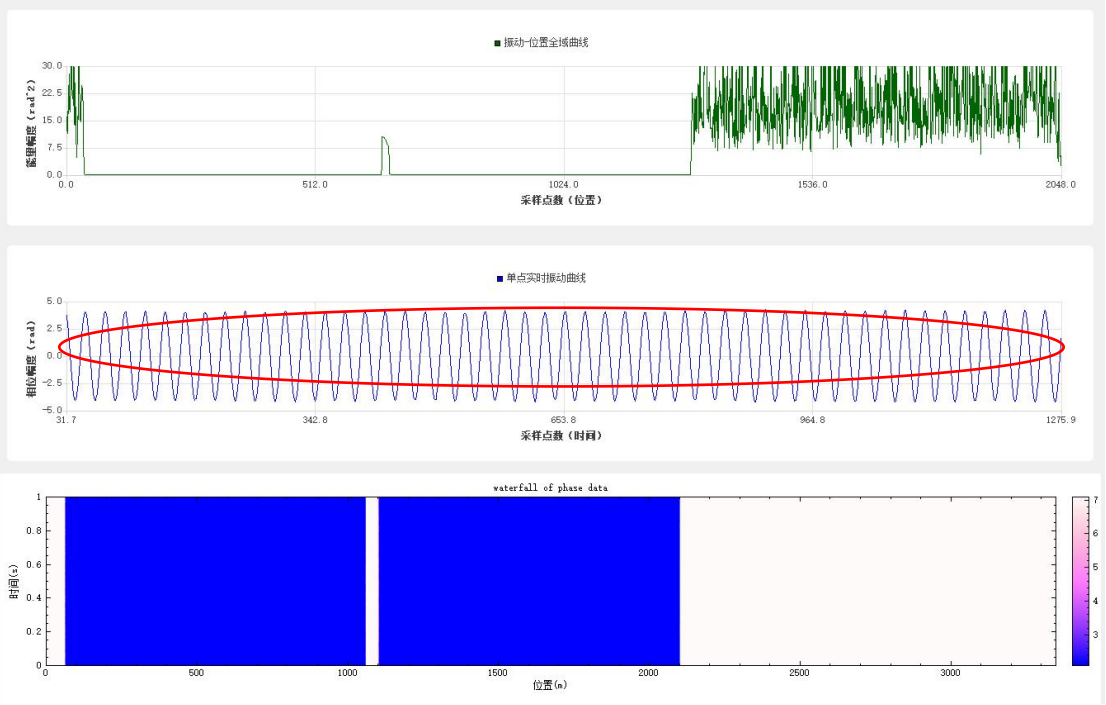
command call flow

It is best to set all parameters once before sampling to ensure that the acquisition card parameters are consistent with expectations. Do not adjust parameters halfway after starting acquisition. You can query the acquisition card parameter values. Reset parameters to stop acquisition first, and then start acquisition after setting is completed.

7. Test Result

Demodulation curve




振动-位置全域曲线
30.0
22.5
15.0
7.5
0.0
0.0
512.0
1024.0
1536.0
2048.0
采样点数（位置）
单点实时振动曲线
5.0
2.5
0.0
-2.5
-5.0
31.7
342.8
653.8
964.8
1275.9
采样点数（时间）
waterfall of phase data
时间(s)
位置(m)