
GY-DAQ-2480

Dual Channel High Speed DAS Demodulation Card

Version 1. 41

Version Change Description

serial number	change contents	remark
1	The acquisition card realizes full phase demodulation function and realizes full optical cable demodulation.	2025.10.30
2	Fixed some document description errors	2025.11.20
3		
4		
5		



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1. Summarize

GY-DAQ-2480 as a DAS dedicated high-speed data acquisition card, using PCIe interface to communicate with the host computer, on-board high-performance FPGA chip, with rich multiplier and RAM resources. By adopting large-capacity data cache and high-speed data transmission engine technology, it supports real-time upload of original data, and the data transmission rate can reach 2.2GB/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 100 km. 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. The driver has good compatibility, supports multiple versions of Windows and Linux, supports cross-platform use, and facilitates user integration.

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

- 14 bits dual channel synchronous real-time sampling
- 250MSps sampling rate
- DC coupling, 50Ω input impedance
- 2Vpp input voltage range, 0-100MHz analog bandwidth
- ±1V offset can be set to make full use of ADC range
- Up to 88dBc SFDR
- Trigger output pulse
- PCIe2.0 x8 high-speed transmission interface
- Built-in optical fiber sensing demodulation algorithm

Power supply and power consumption

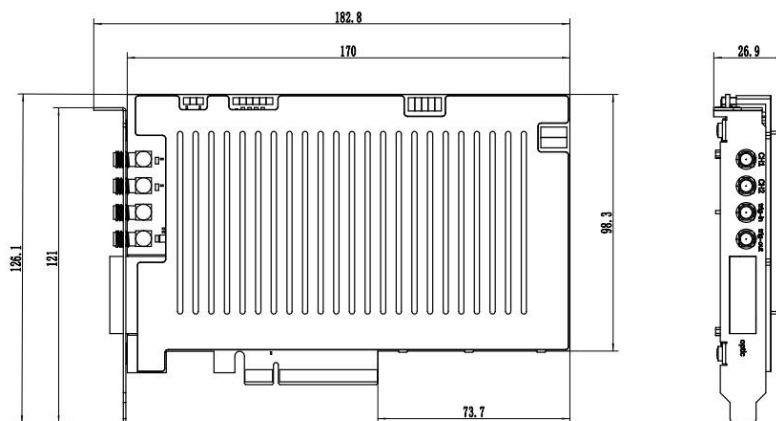
- Power supply: 12V, 0.6A
- Power consumption: 12W (Max)

Temperature range

- Operating temperature: -20 °C ~ 60 °C
- Storage temperature: -40 °C ~ 85 °C

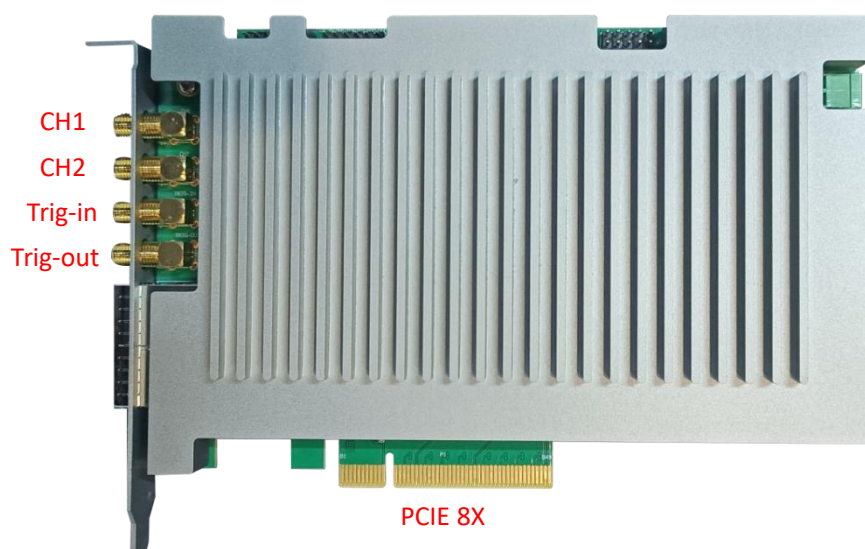
Mechanical size

- 182.8mm(L)x126mm(W)x26.9mm(D)



2. Interface Definition

- PCIe interface: for data transfer and parameter setting
- Ten thousand light ports: reserved
- 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. Interface Function Call Description

GY-DAQ-2480 has built-in IQ demodulation and coherent fading suppression functions, suitable for DAS systems with balanced detectors. It supports both single-channel IQ demodulation and dual-channel IQ demodulation to realize real-time demodulation of all optical cables. Phase data is vibration data (audio data). The maximum number of upload points per pulse trigger is 32768, so the maximum monitoring distance under different resolution rates is:

0.4m: $0.4 \times 32768 = 13107.2\text{m}$

0.8m: $0.8 \times 32768 = 26214.4\text{m}$

1.6m: $1.6 \times 32768 = 52428.8\text{m}$

3.2m: $3.2 \times 32768 = 104857.6\text{m}$

In order to reduce the amount of uploaded data and obtain a larger monitoring distance, it is suggested that the sampling resolution should be more than 1.6m.

■ **int Das Card Open()**

/******

Function Description:

Open the device, call when the program starts, until the program exits, the whole process only needs to be called once, and Das Card Close is called in pairs.

Function parameters:

not have

Function return value:

Success, return 0

Failed, returns-1

/******

■ **void Das Card Close();**

/******

Function Description:

Close the device, call when the program exits, the whole process only needs to be called once, and Das Card Open is called in pairs.

Function parameters:

not have

Function return value:

not have

/******

■ **int Das Card Start()**

/******

Function Description:

Start collecting data. After calling this function, the acquisition card will start collecting data according to the set parameters, and write the data into the buffer for users to read. This function is called after all parameters are set, and it is called in pairs with Das Card Stop.

Function parameters:

not have

Function return value:

Success, return 0

Failed, returns-1

/******

■ **int Das Card Stop()**

/******

Function Description:

Stop collecting data. After this function is called, the acquisition card will stop collecting data. It is called in pairs with the Das Card Start function.

Function parameters:

not have

Function return value:

Success, return 0

Failed, returns-1

/******

■ **Int Das Card Set Demod Guage (int width)**

/******

Function Description:

Set the demodulation pitch, that is, the spatial resolution of demodulation, must be greater than the pulse width, for example, 100ns pulse corresponds to 10m width, then the pitch setting should be greater than 10m, it is recommended to take 1.5 times the pulse width, that is, 15m.

Function parameters:

width: demodulation gauge points, multiplied by the sampling resolution to get the actual meters.

Function return value:

Success, return 0

Failed, returns-1

/******

■ **int Das Card Set Pulse Width(int width)**

/******

Function Description:

Set pulse width in ns, valid when internal trigger is used, trigger output will output trigger pulse of set width.

Function parameters:

width, output trigger pulse width, unit ns, in 4ns steps.

Function return value:

Success, return 0

Failed, returns-1

/***/

■ **int Das Card Set Pulse Frq(int frq)**

/***/

Function Description:

Set trigger pulse frequency, valid when internal trigger is used, trigger pulse of set frequency will be output from trigger output.

Function parameters:

frq, trigger pulse output frequency, unit Hz.

Function return value:

Success, return 0

Failed, returns-1

/***/

■ **int Das Card Set Resolution (int id)**

/***/

Function Description:

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. The relationship between resolution and upload rate is as follows:

0.4m: 250M/s

0.8m: 125M/s

1.6m: 62.5M/s

3.2m: 31.25M/s

6.4m: 15.625M/s

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.

Function parameters:

i d, sampling resolution number, 0: 0.4m, 1: 0.8m, 2: 1.6m, 3: 3.2m, 4: 6.4m.

Function return value:

Success, return 0

Failed, returns-1

/***/

■ **int Das Card Set Sample Num(int num)**

/***/

Function Description:

Set the number of sampling points, that is, the number of data points triggered by one pulse sampling. The number of sampling points multiplied by the resolution shall cover the length of optical cable to be monitored.

Function parameters:

num, trigger sampling points, **must be integer multiple of 256, maximum value is 32768.**

Function return value:

Success, return 0

Failed, returns-1

/*******/

■ **int Das Card Set Pulse Num(int num)**

/*******/

Function Description:

Set the number of data segments written into the buffer at one time. Each pulse triggers sampling of one segment of data. After sampling num segments of data, write them into the buffer at one time for users to read. When users read, read them once according to num segments of data.

Function parameters:

num, the number of data segments written to the cache at one time, recommended value 100.

Function return value:

Success, return 0

Failed, returns-1

/*******/

■ **int Das Card Set Data Sel(int sel)**

/*******/

Function Description:

The board has built-in demodulation algorithm, sel parameter is used to select the corresponding data type in the demodulation algorithm.

Function parameters:

serial number	sel 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	margin 1 Phase 1 margin 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 data is signed 16-bit integers (short), which need to be divided by 512.0 to 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.

Function return value:

Success, return 0

Failed, returns-1

/***/

■ int Das Card Query Fifo()

/***/

Function Description:

Query the valid data stored in the acquisition card, unit Byte, maximum 1GBytes. When the valid data is sufficient, call DasCardReadFifo function to read it for subsequent processing or saving.

Function parameters:

not have

Function return value:

Success, valid cache data size returned in Byte

Failed, returns-1

/***/

■ int Das Card Read Fifo(char *data, int len)

/***/

Function Description:

Read the data of the acquisition card. After the acquisition card starts to collect, you can call this function to read the collected data. The maximum data cache is 1GByte. You need to read the generated data in time, otherwise the data will be discarded after the cache overflows. Before reading, you need to call the DasCardQueryFifo function to query the size of the cached data. Read it after querying enough data.

Function parameters:

data: Pointer to save read data, allocated and released by user;

len: length of data read once, unit: byte, read once according to the number of pulses set by DasCardSetPulseNum function.

Function return value:

Success, return 1

Failure, return 0

/***/

■ int Das Card Cache Clear()

/***/

Function Description:

Clear data cache. Called by default at the start of new sampling to clear the data cache of the last acquisition card.

Function parameters:

not have

Function return value:

Success, return 0

Failed, returns-1

/******

■ **int Das Card Set Offset Voltage(int offset)**

/******

Function Description:

Set the bias voltage. The input range of the acquisition card can be adjusted by setting the bias voltage.

Function parameters:

Default 0 offset, settable range ± 1 V, corresponding offset value ± 8192 .

Function return value:

Success, return 0

Failed, returns-1

/******

■ **int Das Card Set Triger Soure(int trig)**

/******

Function Description:

Set trigger source, internal trigger or external trigger can be set. When internal trigger is used, trigger outputs trigger pulse for AOM or SOA to generate optical pulse. Pulse frequency and pulse width are set by acquisition card. When external trigger is used, acquisition card triggers in to receive external trigger pulse. Acquisition card starts sampling at rising edge of pulse. Pulse frequencyand pulse width are determined by external trigger source.

Function parameters:

trig=0, internal trigger;trig=1, external trigger.

Function return value:

Success, return 0

Failed, returns-1

/******

■ **int Das Card Set Delay(int num)**

/******

Function Description:

Set delay sampling point, skip optical head fiber length

Function parameters:

The number of samples skipped is multiplied by the resolution to obtain the skipped cable length.

Function return value:

Success, return 0

Failed, returns-1

/******

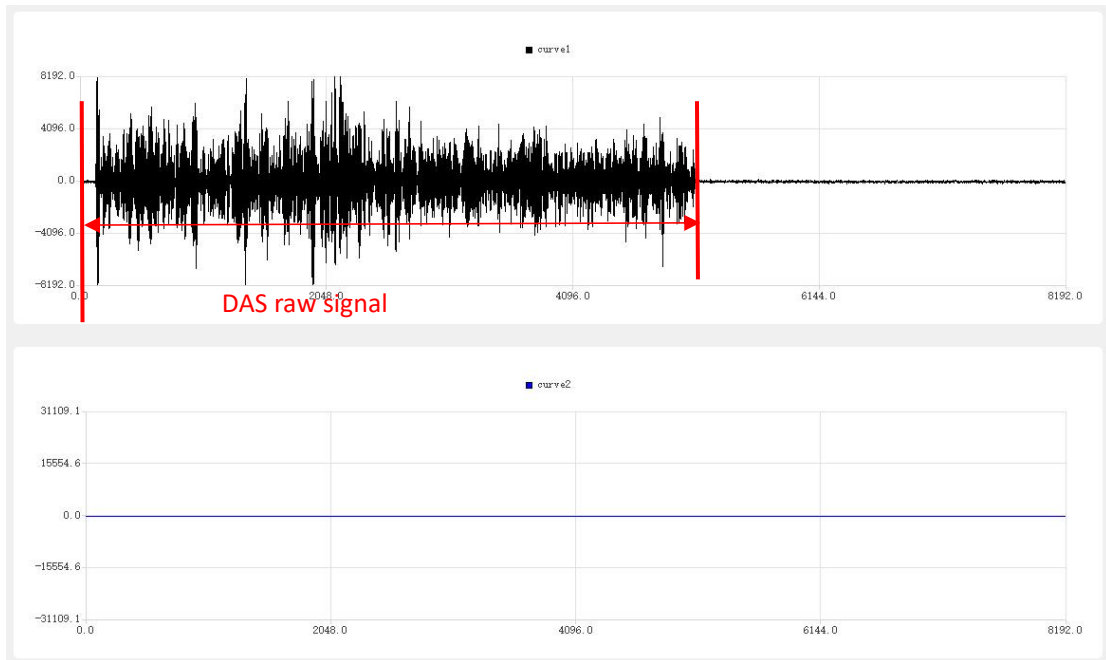
4. Acquisition Card Call Flow

Complete parameter setting before sampling, stop sampling before adjusting parameters, and start sampling again after adjustment.

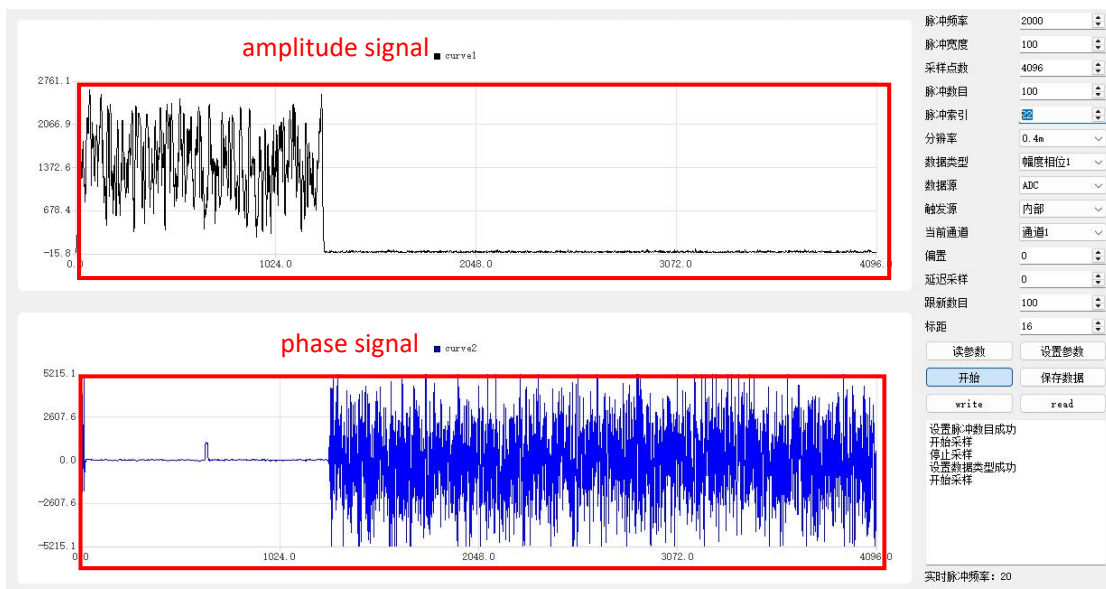


5. Test Result

original curve



amplitude phase signal



PZT single frequency signal demodulation, restore 500Hz sinusoidal excitation signal

