APG7300D　USB-MCA

Command Manual

Version 1.0

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1 Safety Precautions / Disclaimer

Thank you very much for purchasing this product from TechnoAP Co., Ltd. Before using this product, please read this "Safety Precautions and Disclaimer" and be sure to observe the contents and use the product properly.

We are not responsible for any damage caused by abnormality of device, detector, connected device, application, damage to failure, other secondary damage, even if accident caused by using this device.

Prohibited matter

This device cannot be used for applications requiring special quality and reliability related to human life, accident.
This device cannot be used in places with high temperature, high humidity, and high vibration.
Do not apply a power supply that exceeds the rating.
Do not turn the power on while other metals are in contact with the board surface.

Note

If there is smoking or abnormal heat generation in this device, turn off the power immediately.
This board may not work properly in noisy environments.
Be careful with static electricity.
The specifications of this board and the contents of the related documents are subject to change without notice.

Warranty policy

The warranty conditions of "our product" are as follows.

Warranty period: One year from date of purchase.
Guarantee contents: Repair or replacement will be carried out in case of breakdown even though you have used correctly according to this instruction manual within the warranty period.
Out of warranty: We do not warranty if the cause of the failure falls under any of the following.
1. Failure or damage due to misuse or improper repair or modification or disassembly.
2. Failure and damage due to falling etc.
3. Consumables.

2 Overview

2.1 Overview

This device can be connected to a PC via a USB cable and can perform measurement control by sending and receiving commands from environments such as Microsoft Visual Studio, National Instruments LabVIEW, and Linux.

This document explains the handling of measurement control commands for this device.
The contents described in this document are subject to change without prior notice.

2.2 Revision History

May 12, 2025　Version 1.0　First edition

2.3 Environment

The following environment is assumed to be prepared.

(1) FTDI D2XX Drivers are installed.
(2) Our sample program can be executed.

3 Commands

3.1 Overview

All settings and data acquisition for this device are performed via USB communication.
The commands are broadly classified into **Setting**, **Status**, **Histogram**, and **List** commands. The details of each type are described below.

(1) Setting Commands

For setting commands, the PC sends 8 bytes, and the device returns an 8-byte response.
After sending the 8 bytes, the PC must immediately read the 8-byte response.

Example: Setting a mode

PC →Device	Command field (4 bytes) ASCII string 4D4F4457 (MODW)	Parameter field (4 bytes) Binary 0x00000000
Device →PC	Command field (4 bytes) ASCII string 4D4F4457 (MODW)	Parameter field (4 bytes) Binary 0x00000000

[Configuration from the PC]

The command field is 4 bytes and is an ASCII string.
For example, when setting the mode, it is “MODW”, which corresponds to “4D4F4457” in ASCII representation.
The parameter field is a 4-byte binary value in big-endian format (network byte order, MSB first) and represents the value to be set.

[Response from the device]

If the configuration is executed correctly, a response with the same contents as the configured value is returned.
By comparing the configured value with the response value, it is possible to confirm whether the configuration command was executed correctly.

(2) Status Commands

For status commands, when the PC sends 4 bytes, the device returns a 25-byte response.
After sending 4 bytes, it is necessary to immediately read the 25-byte response.

PC →Device	Command field (4 bytes) ASCII string 53545557(STUW)	Parameter field (4 bytes) Binary 0x00000000
Device →PC	Data field (25Byte) Binary real time, CH1 live time, dead time, throughput rate, throughput count	

[Setting from the PC]

The command field is 4 bytes and is an ASCII string.

It is “STUW”, which corresponds to “53545557” in ASCII representation.

The parameter field is a 4-byte binary value and is set to 0.

[Response from the device]

If the command is executed correctly, real time, CH1 live time, dead time, throughput rate, and throughput count are received together.

(3) Histogram Commands

Histogram data has a maximum size of 65536 bytes per channel(65536 bytes = 16384 channels × 4 bytes per channel). Since reading is performed in units of one block (2048 bytes), it is necessary to divide the read operation while specifying the block number to be read.

When the PC sends a histogram read command including block number information (8 bytes), the device returns a 2048-byte response.

After sending the read command, it is necessary to immediately read the 2048-byte response.

This 2048-byte response does not include a header and contains only the histogram data for the specified block.

Each block contains data for 512 channels

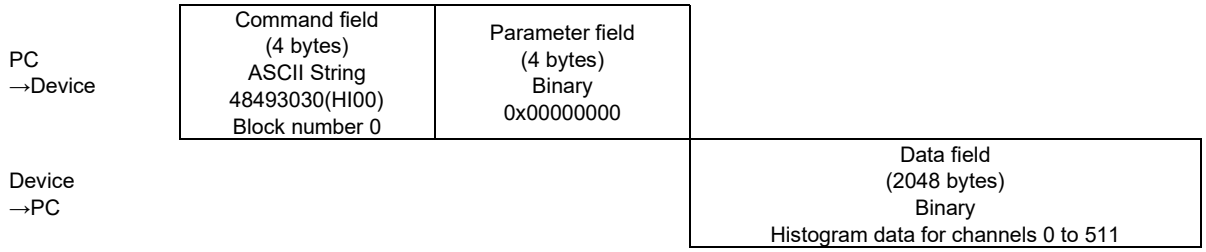
(512 = 2048 bytes / 4 bytes).

To acquire the maximum of 16384 channels, it is necessary to execute the operation 32 times

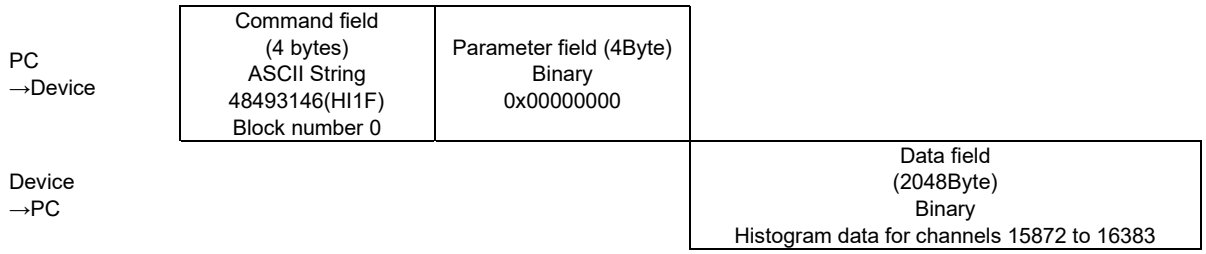
(32 = 16384 channels / 512 channels).

Example: Acquiring histogram data for CH1 for 16384 channels

Histogram data read



* Continue executing in the same manner with block numbers 1 through 31.



[Histogram read and block number setting from the PC]

The command field is 4 bytes and is set as an ASCII string in the “HIXX” format, where XX represents the block number to be read in hexadecimal.

To acquire channels 0 to 511, the ASCII string is “HI00”.

To acquire channels 15872 to 16383, the ASCII string is “HI1F”.

The parameter field is a 4-byte binary value and is set to 0.

The histogram data for the specified channel range of the selected channel is sent from the device as 2048 bytes corresponding to 512 channels.

The same procedure is repeated while specifying ranges as needed to read the required number of channels.

3.2 Command List

Command				Description	Remarks
Category		Abbreviation	ASCII		
Register Setting	CH1(ch.0)	ADGW	41444757	CH1 ADC Gain	
		THRW	54485257	CH1 Threshold	
		LLDW	4C4C4457	CH1LLD	
		ULDW	554C4457	CH1ULD	
		OFSW	4F465357	CH1 Offset	
	Common	MODW	4D4F4457	Mode	0: Histogram (fixed)
		MMDW	4D4D4457	Measurement Mode	0：real time, 1：live time
		MT0W	4D543057	Measurement Time	Upper 12 bits
		MT1W	4D543157		Lower 32 bits
		PDSW	50445357	Peak Detection Mode	
		AQSW	41515357	Measurement Start	
		AQEW	41514557	Measurement Stop	
		CLRW	434C5257	Clear	
Status		STUW	53545557	Status	real time, CH1 live time, etc.
Histogram		HI00	48493030	Histogram Memory Read Read in units of 512 points × 4 bytes	0～511Channels
		HI01	48493031		512～1023 Channels
		HI02	48493032		1024～1535 Channels
		HI03	48493033		1536～2047 Channels
		HI04	48493034		2048～2559 Channels
		HI05	48493035		2560～3071 Channels
		HI06	48493036		3072～3583 Channels
		HI07	48493037		3584～4095 Channels
		HI08	48493038		4096～4607 Channels
		HI09	48493039		4608～5119 Channels
		HI0A	48493041		5120～5631 Channels
		HI0B	48493042		5632～6143 Channels
		HI0C	48493043		6144～6655 Channels
		HI0D	48493044		6656～7167 Channels
		HI0E	48493045		7168～7679 Channels
		HI0F	48493046		7680～8191Channels
		HI10	48493130		8192～8703 Channels
		HI11	48493131		8704～9215 Channels
		HI12	48493132		9216～9727 Channels
		HI13	48493133		9728～10239Channels
		HI14	48493134		10240～10751Channels
		HI15	48493135		10752～11263Channels
		HI16	48493136		11264～11775Channels
		HI17	48493137		11776～12287Channels
		HI18	48493138		12288～12799Channels
		HI19	48493139		12800～13311Channels
		HI1A	48493141		13312～13823Channels
		HI1B	48493142		13824～14335Channels
		HI1C	48493143		14336～14847Channels
		HI1D	48493144		14848～15359Channels
		HI1E	48493145		15360～15871Channels
		HI1F	48493146		15872～16383Channels

3.3 Command Description

*For details of each setting, refer to the “USB-MCA User’s Manual” supplied with the device.

(1) ADC Gain

Description Sets the ADC gain and the number of channels.

Range 0: 16384 channels
1: 8192 channels
2: 4096 channels
3: 2048 channels
4: 1024 channels
5: 512 channels

(2) Threshold

Description Sets the threshold level for waveform acquisition.
The value must be equal to or lower than the LLD setting.

Range 0 to 16383

(3) LLD

Description Energy LLD (Lower Level Discriminator). The unit is channel count.
The value must be equal to or greater than the threshold and less than the ULD.

Range 0 to 16383

(4) ULD

Description Energy ULD (Upper Level Discriminator). The unit is channel count.
The value must be greater than the LLD.

Range 0 to 16383

(5) Offset

Description Sets the positive offset value in channel units.

Range 0 to 16383

(6) Mode

Description Sets the operation mode.

Range 0: Histogram (fixed)

(7) Measurement Time

Description Sets the measurement time.

The internal clock operates at 25 MHz, so the value is calculated as:

Measurement time (seconds) × 25,000,000r

The value is divided into two registers: upper 12 bits and lower 32 bits.

Range Maximum 192 hours

(60 seconds × 60 minutes × 192 hours × 25,000,000 = 17,280,000,000,000)

In this case, set 0xFB7 to the upper register and 0x50430000 to the lower register.

(8) Peak Detection Method

Description Selects the method for detecting the peak (maximum pulse height).

Range 0: abs

1: fast

(9) Measurement Start

Description Starts the measurement.

Range 1: Start

(10) Measurement Stop

Description Stops the measurement.

Range 1: Stop

(11) Clear

Description Clears the measurement time and measurement data.

Range 0: Clear

(12) List Data Read Start

Description Starts reading list data.

Range 0 (fixed)

(13) Status

Description Retrieves status information.

No.	Item Description	Size (Byte)
1	Real Time (40 ns per count)	6
2	CH1 Live Time (40 ns per count)	6
3	CH1 Dead Time (40 ns per count)	6
4	CH1 Throughput Count Rate	3
5	CH1 Throughput Total Count	4
Total		25