Communication Protocol

◆ Overview

The control command is generally in the command line mode, the communication rate is 115200, the PC issues an instruction, the machine parses and executes, and then returns the result to the PC. The following explains the different commands.

The format of the sent data are as follows:

Start bit	Operator	Function code	Connect code	Data field	End code
:	W R a b	0-99	=	Description as follows	Enter line feed <CR><LF>

Description:

(1) The start bit is a colon (:) in the ASCII character table.

(2) The operators are the four small characters in the ASCII character table. "w" is the write command used to set various parameters, "r" is the read command used to return the parameters in the machine, "a" command is used to write arbitrary wave data, and the "b" command is used to read arbitrary wave data.

(3) The function code is a value in the ASCII character table, and the difference in values represents different parameter settings.

(4) Data field: The data field is equivalent to the operand of the command, and the number is from 1 to 2048. Each data is distinguished by "," or ".".

Such as: w23=25786,0. <CR><LF> The operand of this instruction is 2, the first operand is “25786”, the output frequency is set to 257.86, and the second operand is “0”. The unit is Hz. In short, this command sets the frequency of channel 1 to 257.86 Hz.

(5) End code: Each instruction ends with a enter + line feed.

<CR> represents enter in the ASCII character table (hexadecimal is 0x0d).

<LF> is a line feed character in the ASCII character table (hexadecimal is 0x0a).

The following are the above two ways to indicate enter and line feed.

◆W instruction

Channel output status setting

For example: PC sending: w20=1, 1.<CR><LF> means that the channel 1 and 2 waveform output status is on, and the machine returns OK to indicate that the setting is successful.

For example: PC sending: w20=0,0.<CR><LF> means that the channel 1 and 2 waveform output status is off, and the machine returns OK to indicate that the setting is successful.

(1) Waveform setting

For example: PC sending: w21=0.<CR><LF> means that the waveform output from channel 1 is sine wave, and the machine returns OK to indicate that the setting is successful.

The PC sending: w21=101.<CR><LF> means that the channel output waveform is set to arbitrary waveform 01, and the machine returns OK to indicate that the setting is successful.

The PC sends w22=0.<CR><LF> to indicate that the waveform output from channel 2 is a sine wave, and the machine returns OK to indicate that the setting is successful.

The settings for other waveforms are as follows:

Channel 1	Waveform	Channel 2
:w21=0.<CR><LF>	Sine wave	:w22=0.<CR><LF>
:w21=1.<CR><LF>	Square wave	:w22=1.<CR><LF>
:w21=2.<CR><LF>	Pulse wave	:w22=2.<CR><LF>
:w21=3.<CR><LF>	Triangle wave	The following are the same as above
:w21=4.<CR><LF>	Partial sine wave	
:w21=5.<CR><LF>	CMOS wave	
:w21=6.<CR><LF>	DC level	
:w21=7.<CR><LF>	Half wave	
:w21=8.<CR><LF>	Full wave	
:w21=9.<CR><LF>	Positive-step wave	
:w21=10.<CR><LF>	Anti-step wave	
:w21=11.<CR><LF>	Noise wave	
:w21=12.<CR><LF>	Index rising	
:w21=13.<CR><LF>	Index reducing	
:w21=14.<CR><LF>		
:w21=15.<CR><LF>	Sinck pulse	
:w21=16.<CR><LF>	Lorentz pulse	
As :w21=101.<CR><LF> indicates arbitrary wave 01, :w21=102.<CR><LF> means arbitrary wave 02, and so on, until the maximum 160 represents an arbitrary wave 60.		

(2) The frequency setting is as follows

The PC sending :w23=25786,1.<CR><LF> Set the output frequency of channel 1 to 0.2586. The unit is KHz. If the machine returns OK, the setting is successful.

The PC sends: w24=25786, 3.<CR><LF> Set the output frequency of channel 2 to 257.86. The unit is mHz. If the machine returns OK, the setting is successful.

Other situations are as follows:

Channel 1	Channel 2

:w23=25786,0.<CR><LF> is set to 257.86Hz	:w24=25786,0.<CR><LF>
:w23=25786,1.<CR><LF> is set to 0.25786KHz	:w24=25786,1.<CR><LF>
:w23=25786, 2.<CR><LF> is set to 0.00025786MHz	The following are the same as above
:w23=25786, 3.<CR><LF> is set to 257.86mHz	
:w23=25786,4.<CR><LF> is set to 257.86uHz	

(3) The amplitude is set as follows

The PC sends: w25=x.<CR><LF> When x=30, the channel 1 amplitude output is 0.03v, and the machine returns OK to indicate that the setting is successful.

The PC sends: w26=x.<CR><LF> When x=30, the channel 2 amplitude output is set to 0.03v, and the machine returns OK to indicate that the setting is successful.

(4) Duty cycle is set as follows

PC sends: w29=x.<CR><LF> When x=500, set the channel 1 duty cycle output to 50%, and the machine returns OK to indicate that the setting is successful.

The PC sends: w29=x.<CR><LF> When x=500, the channel 2 duty cycle output is set to 50%, and the machine returns OK to indicate that the setting is successful.

(5) The offset setting is as follows

The PC sends: w27=1999.<CR><LF>, set the offset output of channel 1 to 9.99v, and the machine returns OK to indicate that the setting is successful.

The PC sends: w27=1.<CR><LF>, set the offset output of channel 1 to -9.99v, and the machine returns OK to indicate that the setting is successful.

When the value is four digits, the first digit is 1 for positive offset, and the last three digits for amplitude. For example, the PC sends: w27=1255.<CR><LF>, indicating that the offset is positive. The value of 2.55V is less than 4 digits, indicating negative offset. The calculation method is 1000-(send value). For example, the PC sends: w27=255, <CR><LF>, which means that the offset output is set to 1000-255=745 (the bias output is negative offset - 7.45V).

When setting the offset output of channel 2, just change :w27 to: w28, and the others will not change. For example, if the PC sends: w28=1.<CR><LF>, set the offset output of channel 2 to -9.99v, and the machine returns OK to indicate that the setting is successful.

(6) The phase setting is as follows

The PC sends: w31=100.<CR><LF>, indicating that the phase output is 10° , and the machine returns OK to indicate that the setting is successful.

The PC sends: w31=360.<CR><LF>, indicating that the phase is 0° , and the machine returns OK to indicate that the setting is successful.

(7) Tracking settings are as follows

The PC sends: w54=x, x, x, x, x.<CR><LF>, the value of the operand in the trace setting (the value of x) is 1 or 0, 1 means synchronous, 0 means asynchronous, and Channel 1 is the operation object for synchronization. The parameters

corresponding to the number of operands are: w54 = frequency, waveform, amplitude, offset, duty cycle.

The PC sends: w54=1,0,0,0,0.<CR><LF>, set the frequency synchronization (waveform amplitude offset duty cycle is asynchronous), and the machine returns OK to indicate that the setting is successful.

The PC sends: w54=1,1,0,0,0.<CR><LF>, set the frequency and waveform synchronization (the amplitude offset duty is asynchronous), and the machine returns OK to indicate that the setting is successful.

(8) Extended function (write instructions)

For example, the PC sends: w32=x, x, x, x.<CR><LF>, the value of the operand (the value of x) can only be 1 or 0.

For example, if the PC sends: w32=0,0,0,0.<CR><LF>, it means that the counter sweep amplitude modulation burst is turned off, and the measurement is turned on. If the machine returns OK, the setting is successful.

For example, if the PC sends: w32=1,0,0,0.<CR><LF>, the counter starts counting, and the machine returns OK to indicate that the setting is successful.

If the PC sends: w32=0,0,0,0., it means the counter stops. The machine returns OK to indicate that the setting was successful.

Other situations are as follows:

:w32=0,0,0,0.<CR><LF>	Measurement starting (counting sweep frequency modulation burst stopping)
:w32=1,0,0,0.<CR><LF>	Counting starting
:w32=0,1,0,0.<CR><LF>	Sweep starting

:w32=1,0,1,1.<CR><LF>	Pulse starting
:w32= 1,0,0,1.<CR><LF>	Start bursting

(9) Switching of the function panel

If the PC sends: :w33=0.<CR><LF>, the machine panel will switch to the main panel and channel 1 will be the main channel. If the machine returns OK, the setting is successful.

If the PC sends: :w33=1.<CR><LF>, the machine panel will switch to the main panel and channel 2 will be the main channel. If the machine returns OK, the setting is successful. Other situations are as follows:

:w33=0.<CR><LF>	Channel 1 is the main channel
:w33=1.<CR><LF>	Channel 2 is the main channel
:w33=2.<CR><LF>	SYS (system settings)
:w33=4.<CR><LF>	Measurement interface switching
:w33=5.<CR><LF>	Counting interface switching
:w33=6.<CR><LF>	Channel 1 sweep interface
:w33=7.<CR><LF>	Channel 2 sweep interface
:w33=8.<CR><LF>	Pulse interface
:w33=9.<CR><LF>	Burst interface

(10) Extended function (measurement function)

For example, if the PC sends: w36=0.<CR><LF>, it means that the coupling is switched to AC, and the machine returns OK, indicating that the setting is successful.

For example, if the PC sends: w38=0.<CR><LF>, it means that the measurement mode is set to the frequency, and the machine returns OK, indicating that the setting is successful.

Other situations are as follows:

:w36=0.<CR><LF>	Coupling AC
:w36=1.<CR><LF>	Coupling DC
:w37=100.<CR><LF>	Set the gate time for 1 second.
:w38=0.<CR><LF>	Set measurement mode (count frequency)
:w38=1.<CR><LF>	Set measurement mode (counting period)
:w39=0.<CR><LF>	Count clear

(11) Extended function (burst)

Pulse number setting

For example, if the PC sends: w49=5.<CR><LF>, the number of pulses is set to 5, and the machine returns OK, indicating that the setting is successful.

For example, if the PC sends: w49=100.<CR><LF>, the number of pulses is set to 100, and the machine returns OK, indicating that the setting is successful.

The PC sends: w59=1.<CR><LF>, indicating that it is sent once (equivalent to the OK button in burst)

Burst mode settings:

PC sending	Burst mode
:w50=0.<CR><LF>	Manual trigger
:w50=1.<CR><LF>	CH2 burst
:w50=2.<CR><LF>	External burst (AC)
:w50=3.<CR><LF>	External burst (DC)

(12) Extended function (sweep)

Starting frequency setting:

The PC sends: w40=1000.<CR><LF>, the setting start frequency is 10Hz, and the machine returns OK, indicating that the setting is successful.

Termination frequency setting:

The PC sends: w41=1000.<CR><LF>, the setting termination frequency is 10Hz, and the machine returns OK, indicating that the setting is successful.

The PC sends: w42=10.<CR><LF>, set the sweep time to 1 second, and the machine returns OK, indicating that the setting is successful.

Sweep direction

PC sending	Sweep direction
:w43=0.<CR><LF>	Normal
:w43=1.<CR><LF>	Reverse
:w43=2.<CR><LF>	Round trip

Sweep mode

PC sending	Sweep mode
:w44=0.<CR><LF>	Sweep mode is linear
:w44=1.<CR><LF>	Sweep mode is logarithm

(12) Extended function (pulse function)

Pulse width setting

The PC sends: w45=1000,0.<CR><LF>, set the pulse width to 1000 units as ns, and the machine returns OK, indicating that the setting is successful.

The PC sends: w45=1000, 1.<CR><LF>, set the pulse width to 1000 units to us, and the machine returns OK, indicating that the setting is successful.

Period setting

The PC sends: w46=1000, 0.<CR><LF>, the setting period is 1000 units as ns, and the machine returns OK, indicating that the setting is successful.

The PC sends: w46=1000, 1.<CR><LF>, the setting period is 1000 units us, and the machine returns OK, indicating that the setting is successful.

Offset setting

The PC sends: w47=100.<CR><LF>, set the offset to 100%, and the machine returns OK, indicating that the setting is successful.

Amplitude setting

The PC sends: w46=500.<CR><LF>, the setting range is 5.00 units V, and the machine returns OK, indicating that the setting is successful.

Recall and save

For example, if the PC sends: w70=5. <CR><LF>, it means that the parameter is stored in the 5 position machine and the machine returns OK, indicating that the setting is successful.

For example, if the PC sends: w71=5. <CR><LF>, it means that the parameter is returned at the 5 position. The machine returns OK, indicating that the setting is successful.

For example, if the PC sends: w72=5. <CR><LF>, it means that the parameter machine that clears the 5 position returns OK, indicating that the setting is successful.

◆a,b instruction

The a, b instructions are arbitrary wave writes and reads, which are described in detail below.

(1) Write arbitrary wave command (a instruction)

If the PC sends: a01=2048,2048,....2048.<CR><LF>, the machine returns OK, indicating that the waveform written to the arbitrary wave 1 is DC level. In the data field, 2048 indicates that the ordinate value (y-axis) is 0, when the value is 4095, it indicates that the ordinate value (y-axis) is 1, and when the value is 0, it indicates that the ordinate value (y-axis) is - 1, the operand of arbitrary wave writing is 2048 bits.

If the PC sends: a02=2048, 2048, . . . 2048.<CR><LF>, the machine returns OK, indicating that the waveform written to the arbitrary wave 2 is DC level.

For example, if the PC sends: a03=2048, 2048, . . . 2048.<CR><LF>, the machine returns OK, indicating that the waveform written to the arbitrary waveform 3 is DC level. (The maximum number of arbitrary waves is 60)

(2) Command to read arbitrary waves (b instruction)

If the PC sends: b01=0.<CR><LF>, the machine returns the data of arbitrary wave 01: b01=2048, 2048,.....2048.<CR><LF>, in its data segment The numerical expression of the ordinate (y-axis) is the same as above, and the description is not repeated here.

◆R instruction

The r instruction is a read instruction, and the command format is basically the same as the write instruction format, and the description is not repeated. The read instruction and the write instruction mostly correspond to each other, and the following examples are described in detail.

(1) The case where the read command does not correspond to the write command is as follows:

For example, if the PC sends: r80=0.<CR><LF>, the machine returns: r80=125. , indicating that the current count value is 125.

When the PC sends : r81=0.<CR><LF>in the frequency mode, the machine returns: r81=100000., indicating that the current measured frequency is 10000Hz.

When the PC sends :r82=0.<CR><LF> in the period mode, and the machine returns: r81=100000., indicating that the currently measured frequency is 10000Hz.

Other situations are as follows:

:r80=0.<CR><LF>	Read count value
:r81=0.<CR><LF>	Read the frequency value (in the frequency mode)
:r82=0.<CR><LF>	Read frequency value (in period mode)

:r83=0.<CR><LF>	Read positive pulse width
:r84=0.<CR><LF>	Read negative pulse width
:r85=0.<CR><LF>	Read period
:r86=0.<CR><LF>	Read duty cycle
:r00=0.<CR><LF>	Read machine model
:r01=0.<CR><LF>	Read machine number

(2) Quickly read as follows:

The PC sends: r81=4.<CR><LF>, and the machine returns data from the count value to the negative pulse width.

The PC sends: r81=5.<CR><LF>, and the machine returns data from the count value to the period.

The PC sends: r00=1.<CR><LF>, and the machine returns to read the model and number of the machine.

The case where the read command corresponds to the write command is as follows:

The PC sends: r21=0.<CR><LF>, which means that the current waveform of channel 1 is read. If it returns: r21=0., the current waveform is sine wave. If it returns: r21=1., the current waveform is square waves, other ones correspond to write commands will not be explained here.

The PC sends: r21=10.<CR><LF>, which indicates the waveform-to-phase data of channels 1 and 2.

The PC sends: r23=8.<CR><LF>, which indicates the frequency-to-phase data of channels 1 and 2.

The other read commands are the same as above.