

# Engineer Application Note EE-101

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## DSP processor control protocol

Rev 4      Updated on 2022-3-28

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### introduction

External control programming supports UDP,RS232 and RS232 coding, and the control protocol covers all control parameters of the processor, including parameter control, parameter acquisition, and preset call.

When using UDP control, the default port is 50000, and the port can be set in "Device Settings" through the DSP Controller software.

Using RS232/RS485 control, the default baud rate is 115200, data bit 8, stop bit 1, no check digit. It can also be set in "Device Settings". When **RS232/RS485 is sent, the interval between messages needs to be maintained at more than 200** milliseconds.

If the central control needs to reply, please turn on the central control reply switch in the "Device Settings" in the DSP Controller software.

There are two versions of the control protocol, V1 and V2, V1 is a fixed-length message packet, and V2 is a variable-length message packet.

Note: This document is only applicable to the DSP fixed architecture and is not compatible with the company's open software architecture products. This documentation is updated with product updates, please pay attention to the purchased products and contact after-sales for the latest documents.

### V1 versioning protocol

Software encoding rules (12 bytes total).

byte1	byte2	byte3	byte4	byte5~12
0xb3	Message type	0x00	0x00	data

The **byte3** byte may not be **0x00** when the PC software takes the value, because the PC software has not been updated to the latest control protocol. However, it does not affect the use, and the **byte3** field is a reserved field in the **V1** version.

byte4 is also used as an identifier for the return code to identify that the command is a reply command. V1 sends a control command of 0x00 and the device replies with 0xe0.

**Message type (byte2):** 0x21 (parameter control), 0x22 (parameter acquisition), 0x13 (switching scene).

**When** the message types are 0 **x21 and 0x22**, the data area format is:

byte5-6	Module ID, see Appendix A
byte7-8	See Appendix B for parameter types

byte9-10	Parameter value 1
byte11-12	Parameter value 2

Most modules only have one valid parameter, such as controlling the compressor switch, switch value (1-off, 0-on), and only need to fill in parameter value 1.

In the case of two parameters, there are input module, output module, equalization module, and automix module.

**Input and output module, parameter value 1 fill in the channel number** (starting from 0), parameter value 2 fill in the parameter value, such as mute (1-mute,0 - Non-mute).

The control input block channel one gain step is +2dB: B32100002B010A000000C800

Control input module channel one gain to -36dB: B32100002B0101000000F0F1

**Equalization module**, parameter value 1 fills in the segment number (starting from 0), parameter value 2 fills in gain, Q value, frequency, etc.

**Automix module**, subchannel setting uses 2 parameters, parameter 1 fill in the channel number, parameter 2 fill in the specific value, such as priority, gain, mute, etc.

The frequency of the control input channel one equalizer subsegment 3 is 450Hz:

B3210000610003000200C201

Control automix subchannel 5 mute switch: B3210000A100060004000100

**Matrix routing has three parameters, the first is the input channel number, the second is the** output channel number, and the third is the routing switch. At this time, the byte9 of parameter value 1 is filled in with the channel number, byte10 is filled in with the output channel number, and the parameter value 2 is filled in with the routing switch.

The switch to control the mixing module input 3 to output 4 is on: B3210000A600010002030100

**There are three parameters to get a matrix route**, the first is the input channel number, the second is the output channel number, and the third is the routing switch. At this time, the byte9 of parameter value 1 enters the channel number, byte10 fills in the output channel number, and the parameter value 2 fills in the routing switch.

**The control mix module input 3 to output 4 switch on:**

Send: B3220000A600010002030000

**Remark:**

**22: obtain**

**0203: Represents input and output (starting from 00).**

**0000: The default is OK**

Re: B32200E0A600010002030100

**Remark:**

**0203: Represents input and output (starting from 00).**

**0000:0000 for off, 0100 for on**

**When the message type is 0x13** switching scenes (**preset**), bYTE5-6 fill in the scene number, a total of 16 sets of scenes (0-15)。

Switch preset 10: B31300000900000000000000

For floating-point type values, multiply by 100 to become a 16-bit integer before

transmission, such as 12.15, send 1215, hexadecimal 0x04BF. -4.9, send -490, hexadecimal is 0xFE16.

Assuming a value of 3 needs to be set:

We need to convert the value X100 to hexadecimal to 12C. Only when the high bit changes to 2C 01 before sending this instruction will our processor recognize the value as set to 3

## V2 versioning protocol

### Software coding rules (variable length)

byte1	byte2	byte3	byte4	byte5~132
0xb3	Message type	length	0x01	data

byte4 is also used as an identifier for the return code to identify that the command is a reply command. V2 sends the control command as 0x01 and the device replies with 0xe1

There are several types of message types as shown in the following table.

Message type	length	data format	illustrate
0x21 (parameter control).	Variable length	byte5	0x1 - Output 0x2 - Input 0x3 - Reserved <b>0x4 - Feedback suppression</b> <b>0x5 - Automatic gain</b> <b>0x6 - Voice tracking</b>
		byte6	The starting channel number (starting at 0).
		byte7	End channel number (starting at 0).
		byte8	Parameter types ( <i>as defined in Appendix B</i> ).
		byte9-72	Parameter values, each channel occupies two bytes, sorted sequentially. It can store up to 32 channels. If the parameter values of each channel are the same, fill in one.
The control input 2-6 channels are muted, the code is: b3210a010201050201000100010001000100			
0x22 (parameter acquisition).	Variable length	byte5	0x1 - Output 0x2 - Input 0x3 - Reserved <b>0x4 - Feedback suppression</b> <b>0x5 - Automatic gain</b> <b>0x6 - Voice tracking</b>
		byte6	The starting channel number (starting at 0).
		byte7	End channel number (starting at 0).
		byte8	Parameter types ( <i>as defined in Appendix B</i> ).
		byte9-72	Parameter values, each channel occupies two bytes, sorted sequentially. It can store up to 32 channels.
Get the input 2-6 channel level with the code: b3220a010201050c0000000000000000000000 The reply was: B3220A010201050C40ED5AF179EC96ECEECE			
0x74 (externally controlled).	Variable length	byte5	Control Type: 0x1 - GPIO control 0x2 - RS232 sends the code 0x3 - RS485 sends the code 0x4 - Turn on central control reply 0x5 - Gets the number of device channels

			0x6 – Resets the current preset, does not save 0x7 – Set the RS485 direction 0x8 – UDP forwarding code 0x9 – Turn on the System Debug switch
		byte6	Data length (valid data length populated with byte9-132).
		Byte7-8	0x0000
		byte9-132	Depending on the byte5 control type, see the external control description.

## External control description

Control type	data format	illustrate
0x1 (GPIO control).	byte9	GPIO direction, 0-input, 1-output
	byte10	Starting GPIO number (starting at 0).
	byte 11	End GPIO number (starting from 0).
	byte12	The value, expressed bitwise, a total of 8 bits represents a maximum of 8 GPIOs.
	Set GPIO 1-8 output high: <code>b374080101000000010007ff</code> Read GPIO 1-8 level value: <code>b37408010100000000000700</code> The return value is: <code>b374080101000000000007FF</code>	
0x2 (RS232 send code).	byte6	RS232 code length
	byte9-132	RS232 output code
Output the string "Hello, DSP." from RS232" <code>B3741001020c000048656c6c6fa3ac4453502e00</code>		
0x3 (RS485 send code).	byte6	RS485 code length
	byte9-132	RS485 output code
Output the string "Hello, DSP." from RS485" <code>B3741001030c000048656c6c6fa3ac4453502e00</code> Note: Set RS485 to send mode first.		
0x4 (enable central control reply).	byte9-12	Reply switch: 0 - off, 1 - on
	Enable the central control reply: <code>b37408010400000001000000</code> Close the central control reply: <code>b37408010400000000000000</code>	
0x5 (get the number of device channels).	bandte9-24	Device name
	byte25	Number of analog audio input channels
	byte26	The number of analog audio output channels
	byte27	Number of Dante audio input channels
	byte28	The number of Dante audio output channels
	The directive code is as follows: <code>b374140105000</code> The reply is as follows: <code>B3741401050000004453502D3838442D313337306165000008080808</code> The device name is "DSP-88D-1370ae", and there are 8 analog and Dante audio inputs and outputs.	
0x6 (resets current	The code is as follows:	

preset, does not save).	b374040106000000	
Control type	data format	illustrate
0x7 (sets RS485 direction).	byte9-12	Direction: 1 - input, 0 - output
	RS485 defaults to input mode, set the output format as follows: b37408010700000000000000	
0x8 (UDP forwarding code).	byte 9-12	IP address
	byte 13-14	port
	byte 15-16	Forward data length
	byte 17-132	Forward data
	Forward the string "Hello, DSP." to 192.168.1.165 on device port 3001: b374180108000000c0a801a5b90b0c0048656c6c6fa3ac4453502e00	
0x9 (system debug switch).	byte 9-12	1 - Turn debugging on, 0 - Turn off debugging
	Turn on the debug switch: b37408010900000001000000 This function is only for debugging, and the system will output runtime logs to the serial port.	

## Appendix A Module ID Assignment

Module name	ID	Module name	ID
Input source	299	Output channel 1-32 high and low pass	167~198
Input channel 1-32 expander	1~32	Output channel 1-32 equalizer	199~230
Input channel 1-32 compressor	33~64	Output channel 1-32 delay	231~262
Input channels 1-32 automatic gain	65~95	Output channel 1-32 limiter	263~294
Input channel 1-32 equalizer	97~128		
Input channels 1-32 feedback rejection	129~160		
Automix	161	Echo cancellation selector	162
Echo cancellation	163	Noise suppression selector	164
Noise suppression	165		
Audio mixer	166		
output	295		
System control	296		

## Appendix B Module Parameter Types

Module name	The parameter type	illustrate	Module name	The parameter type	illustrate
Input source	0x1	gain	output	0x1	gain
	0x2	mute		0x2	mute
	0x3	sensitivity		0x3	Channel name
	0x4	Phantom power switch		0x4	Inverted
	0x5	Signal generator type		0x5	sensitivity
	0x6	Signal generator frequency		0x6	Gain step
	0x7	The magnitude of the sine wave gain		0x7	Link
	0x8	Channel name		0x8	Channel level
	0x9	Inverted			
	0xa	Gain step			
	0xb	Link			
	0xc	Channel level		Extender	0x1
Delay	0x1	Bypass switch	0x2		threshold
	0x2	millisecond	0x3		ratio
	0x3	microsecond	0x4		Settling time
equalizer	0x1	Equalizer master switch	0x5		Release time
	0x2	Subsegment switch	Compressor		0x1
	0x3	frequency		0x2	Compressor threshold
	0x4	gain		0x3	Compressor ratio
	0x5	Q value		0x4	Settling time
	0x6	type		0x5	Recovery time
				0x6	Gain compensation
<b>Feedback suppression</b>	<b>0x1</b>	<b>Bypass switch (0 on/1 off).</b>	<b>Automatic gain</b>	<b>0x1</b>	<b>Bypass switch (0 on/1 off).</b>
	<b>0x7</b>	<b>Clear all</b>		<b>0x2</b>	<b>threshold</b>
	<b>0x8</b>	<b>Panic threshold</b>		<b>0x3</b>	<b>Target threshold</b>
	<b>0x9</b>	<b>Depth of feedback</b>		<b>0x4</b>	<b>ratio</b>
	<b>0xa</b>	<b>Feedback threshold</b>		<b>0x5</b>	<b>Settling time</b>
			<b>0x6</b>	<b>Release time</b>	
<b>Voice tracking</b>	<b>0x1</b>	<b>Tracking thresholds</b>		<b>0x2</b>	<b>Default microphone</b>
	<b>0x3</b>	<b>Reaction time</b>		<b>0x4</b>	<b>Toggle the default microphone time</b>
	<b>0x5</b>	<b>Wheel clearance</b>		<b>0x6</b>	<b>Number of rounds</b>
	<b>0x7</b>	<b>Enable tracing</b>		<b>0x8</b>	<b>Mike Priority</b>
	<b>0x9</b>	<b>Serial port type</b>		<b>0xa</b>	<b>Camera address</b>
	<b>0xb</b>	<b>agreement</b>		<b>0xc</b>	<b>Preset points</b>
	<b>0xd</b>	<b>Enable the microphone settings</b>		<b>0xand</b>	<b>The command type</b>
	<b>0xf</b>	<b>The command string</b>		<b>0x10</b>	<b>Send</b>
	<b>0x11</b>	<b>Command enables</b>		<b>0x12</b>	<b>Save</b>

## Document history

<b>recension</b>	<b>description</b>
<i>Rev 1 – 2018-8-10</i>	Initial version release
<i>Rev 2 – 2018-8-17</i>	V1 Release Notes Modified
<i>Rev 3 – 2019-7-23</i>	Added return code recognition, fixed V2 forwarding code
<i>Rev 4 – 2022-3-28</i>	Added feedback suppression and automatic gain parameter control code, and added voice tracking reference control code