This document describes the Native DSP Control Protocol for BlueBridge® Systems. This document is intended for 3rd Party Controller Programmer use to understand the how to interact with BlueBridge® Systems. This protocol supports sending WRITE commands to DSP as well as sending READ commands to read back the DSP status.

Since BlueBridge® Designer version 5.3.0 additional support is built into BlueBridge® to help users obtain necessary parameters more easily. It will also help generate the control string the user can copy and paste it to the program.

Protocol Description

BlueBridge® Protocol

Start Flag [0x04]	Packet Header	Control Packet Payload	Stop Flag [0x05]

Control packets use TCP SOCKET, port #10001.
Read-Control packets (Meters) are received by software thru UDP Socket, port #10003.
Each packet header + payload(s) is wrapped around by a Start and Stop Flag to indicate the beginning and end of a complete packet.

Packet Header

Length	CRC	Type of Connection	Source Mac Address	Destination Mac Address	Type of Payload	Result Code
16	8	8	48	48	8	8 bits

Length:
The Length of the packet is the total length excluding Start and Stop Flags.

CRC:
CRC is modulo-256, excluding itself and Start/Stop Flags in the calculation.

Type of Connection:
Four types of connection: Serial = 0, TCP = 1, UDP = 2, UDP_METER = 3

Source Mac Address:
The Mac Address of the device generating the packet.

Destination Mac Address:
The Mac Address of the device receiving the packet.

Type of Payload:
Four types of payload: CONTROL = 0, CPU = 1, MULTIPLE CONTROL = 2

Result Code:
Result Code for packet. 0 = NO ERROR.

Single Control Packet Payload [Type 0]

Module Name	Type	R/W	Module #	Channel #	Aux #	Parameter #	Value [WRITE ONLY]
64	8	1	15	8	8	8	32 bits

TYPE: This field is used to indicate how the BlueBridge® device handles the Control Payload.

Type #	Action
0	Read from External MEM; Write to DSP
1	Read from DSP
2	Read form External MEM; Write to ANALOG
3	Reserved
4	Read from External MEM; Mute IO before writing to ANALOG
5	Read from DSP when Data changed; Write to DSP
6	Read from External MEM; Write to External MEM
7	Read from External MEM; Write to External MEM but bypassed by Preset Recall

For all other fields, please refer to a separate DSP module and parameter documentation for more details.

Single Control Read Packet Payload [Type 0]

Module Name	Type	R/W	Module #	Channel #	Aux #	Parameter #
64	8	1	15	8	8	8

To perform a READ command to get the current setting of a Control parameter, a Read command message will be used. It will be similar format as a Write message with the following 2 differences.

a) The Read/Write Flag before the module number should be set to "0" to indicate it is a READ

b) Omit the parameter value of 32 bits field. So the Read message is 4 bytes shorter than the Write message.

After sending this through TCP socket the device will reply back with a Single Control Message on the same TCP connection. This reply message contains the full format including the Start/Stop Flag and Header.

The parameter value will be in the Value field of the reply message.

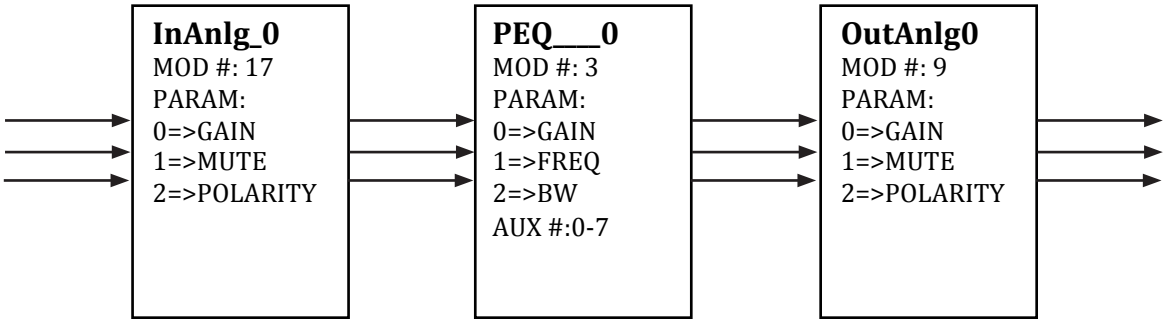
Multiple Control Packet Payload [Type 2]

# of Payloads	Payload 1	Payload 2	…
16	144	144	bits

For Multiple Control Payload, simply construct each payload as above in Type 0 and append each new payload at the end of the previous one.

However, one additional field must be added to the front of the payload list. There must be a 16-bit number, the total number of payload in the packet.

Example 1

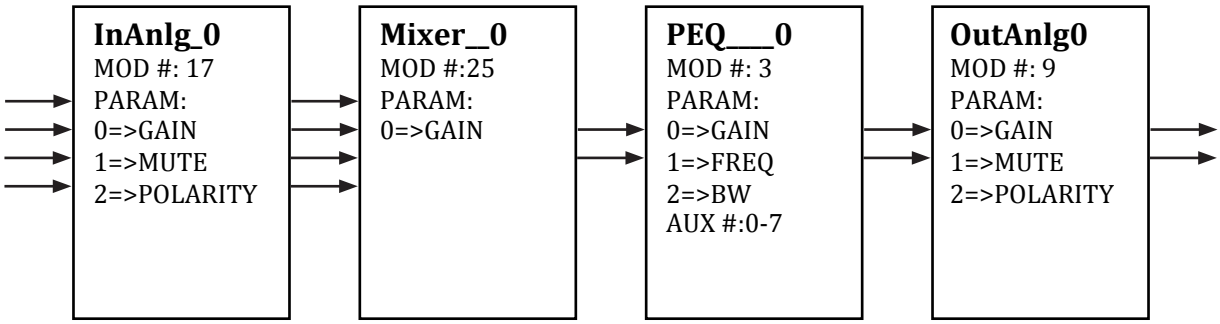


In this schematic, we have 3 modules and each has 3 channels. The MODULE NAME and MODULE # are specified in the box while the PARAMETER available for each module is also listed. Note that there is AUX # for PEQ because it is used to indicate which band of the PEQ the user is controlling. There is a total of 8-bands in the above example. So if the user wants set the EQ of CHANNEL 1 so that there is a +5dB@500Hz and -10dB@1000Hz, then they send 4 messages with packet payloads that look something like these:

PEQ____0	0	1	3	0	0	0	5dB*
PEQ____0	0	1	3	0	0	1	500Hz*
PEQ____0	0	1	3	0	1	0	-10dB*
PEQ____0	0	1	3	0	1	1	1000Hz*

*** Note the data value in the example are not formatted in accord to the DSP specifications, they are for illustration only.**

Example 2



Similar concept as example #1, but this time the PEQ module is MOD #2 because the user added a 4 in-2 out mixer before it.

		OUTPUT	
		1	2
INPUT	1		
	2		
	3		X
	4		

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The mixer is a matrix mixer, so how do we control the cross-point at X? We use the AUX value in this situation for the OUTPUT. So if we want to change the gain to -15dB for INPUT channel 3 going to OUTPUT channel 2, we send this message:

Mixer__0	0	1	25	2 (INPUT)	1(OUTPUT)	0	-15dB

Control String Examples

BLUEBRIDGE® COMMUNICATION PROTOCOL STRINGS

Every string is dependent on a number of variables, so the generic format for different type of controls will be shown first with full examples given in the next page.

Variable Definitions

CS: Checksum, calculated by add all bytes excluding START (0x04), STOP (0x05), and the checksum itself.

XX XX XX XX XX XX: MAC address of device sending the string.

YY YY YY YY YY YY: MAC address of device receiving the string.

CC: Channel number, start counting from zero. (ie. Ch #1 = 0, Channel #2 = 1, etc)

##: Data value as Signed Integer.

For Mute, 0x00000001 = ON and 0x00000000 = OFF

For Gain, 1 = 0x00000001 = 0.001dB and -1 = 0xFFFFFFFF = -0.001dB

Generic Strings

Input – Mute ON
04 00 24 CS 01 XX XX XX XX XX XX YY YY YY YY YY YY 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B CC 00 01 ## ## ## ## 05

Input – Mute OFF
04 00 24 CS 01 XX XX XX XX XX XX YY YY YY YY YY YY 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B CC 00 01 ## ## ## ## 05

Output – Mute ON
04 00 24 CS 01 XX XX XX XX XX XX YY YY YY YY YY YY 00 00 4F 75 74 41 6E 6C 67 30 00 80 0C CC 00 01 ## ## ## ## 05

Output – Mute OFF
04 00 24 CS 01 XX XX XX XX XX XX YY YY YY YY YY YY 00 00 4F 75 74 41 6E 6C 67 30 00 80 0C CC 00 01 ## ## ## ## 05

Input – Set Gain to certain value
04 00 24 CS 01 XX XX XX XX XX XX YY YY YY YY YY YY 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B CC 00 00 ## ## ## ## 05

Output – Set Gain to certain value
04 00 24 CS 01 XX XX XX XX XX XX YY YY YY YY YY YY 00 00 4F 75 74 41 6E 6C 67 30 00 80 0C CC 00 00 ## ## ## ## 05

Example Strings

These string used [00 00 00 00 00 00] as the source MAC address for simplistic. It is acceptable to use [00 00 00 00 00 00] if the sending device is not expecting any reply messages.

Currently the system only accepts ABSOLUTE gain value. There is no UP/DOWN (RELATIVE) volume control at this moment, a separate DSP module to handle this feature will be added in the future.

Input 1 – Mute ON
04 00 24 3E 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B 00 00 01 00 00 00 01 05

Checksum =
00+24+01+00+00+00+00+00+00+60+35+12+86+97+00+00+49+6E+41+6E+6C+67+5F+30+00+80+0B+00+00+01+00+00+00+01 = 0x53E

We just need 1 byte, so the final checksum will be 0x3E.

Input 8 – Mute OFF
04 00 24 44 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B 07 00 01 00 00 00 00 05

Output 5 – Mute ON
04 00 24 65 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 4F 75 74 41 6E 6C 67 30 00 80 0C 04 00 01 00 00 00 01 05

Output 16 – Mute OFF
04 00 24 6F 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 4F 75 74 41 6E 6C 67 30 00 80 0C 0F 00 01 00 00 00 00 05

Input 1 – Set Gain to +3.3dB
04 00 24 2C 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B 00 00 00 00 00 0C E4 05

Since 1 = 0.001dB, so 3300 = +3.3dB = 0x00000CE4 (signed integer).

Output 10 – Set Gain to -40.7dB
04 00 24 CB 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 4F 75 74 41 6E 6C 67 30 00 80 0C 09 00 00 FF FF 61 04 05

Since -1 = -0.001dB, so -40700 = -40.7dB = 0xFFFF61043.3 (signed integer).

More Example Strings

Input 1 – Set Gain to 0dB
04 00 24 3C 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B 00 00 00 00 00 00 00 05

Input 1 – Set Gain to -3dB
04 00 24 76 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B 00 00 00 FF FF F4 48 05

Input 1 – Set Gain to -6dB
04 00 24 B2 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B 00 00 00 FF FF E8 90 05

Input 1 – Set Gain to -9dB
04 00 24 EE 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B 00 00 00 FF FF DC D8 05

Input 1 – Set Gain to -18dB
04 00 24 A3 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B 00 00 00 FF FF B9 B0 05

Input 1 – Set Gain to -100dB (off)
04 00 24 12 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 49 6E 41 6E 6C 67 5F 30 00 80 0B 00 00 00 FF FE 79 60 05

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Preset – Recall Preset #1
04 00 18 0F 01 00 00 00 00 00 00 00 60 35 12 86 97 01 00 00 31 00 00 00 00 05

Note that Preset Recall utilizes a different payload format:

04 00 18 CS 01 00 00 00 00 00 00 00 60 35 12 86 97 01 00 00 31 ## ## 00 00 05

The data value is a 16-bit unsigned integer. For current BlueBridge® systems, preset # ranges from 0x0000 to 0x0045 (70 presets in total, first preset numbered as zero)

Please note that these strings only works for the given schematic, the dynamic Module Number might change if the schematic is modified.

For example, if another DSP module is added in front of the Low Filter, the Low Filter's and High Filter's (and all other DSP modules' in the chain) Module Number will be affected.

Low Filter – Set Level to +6dB
04 00 24 9A 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 4C 53 46 5F 5F 5F 5F 30 00 80 1A FF 00 00 00 00 17 70 05

Low Filter – Set Level to +3dB
04 00 24 D6 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 4C 53 46 5F 5F 5F 5F 30 00 80 1A FF 00 00 00 00 0B B8 05

Low Filter – Set Level to 0dB
04 00 24 13 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 4C 53 46 5F 5F 5F 5F 30 00 80 1A FF 00 00 00 00 00 00 05

Low Filter – Set Level to -3dB
04 00 24 4D 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 4C 53 46 5F 5F 5F 5F 30 00 80 1A FF 00 00 FF FF F4 48 05

Low Filter – Set Level to -6dB
04 00 24 89 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 4C 53 46 5F 5F 5F 5F 30 00 80 1A FF 00 00 FF FF E8 90 05

High Filter – Set Level to +6dB
04 00 24 95 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 48 53 46 5F 5F 5F 5F 30 00 80 19 FF 00 00 00 00 17 70 05

High Filter – Set Level to +3dB
04 00 24 D1 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 48 53 46 5F 5F 5F 5F 30 00 80 19 FF 00 00 00 00 0B B8 05

High Filter – Set Level to 0dB
04 00 24 0E 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 48 53 46 5F 5F 5F 5F 30 00 80 19 FF 00 00 00 00 00 00 05

High Filter – Set Level to -3dB
04 00 24 48 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 48 53 46 5F 5F 5F 5F 30 00 80 19 FF 00 00 FF FF F4 48 05

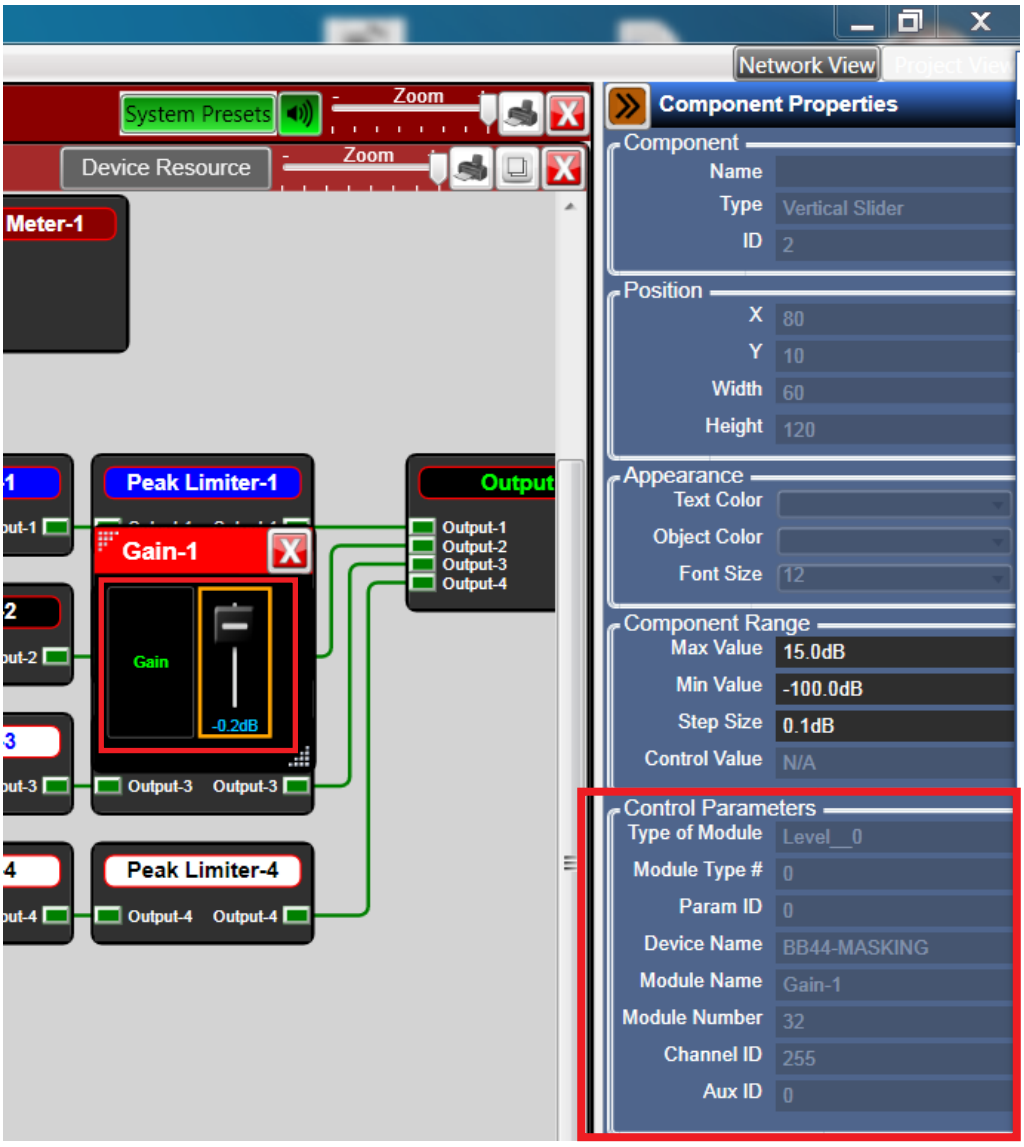
High Filter – Set Level to -6dB
04 00 24 84 01 00 00 00 00 00 00 00 60 35 12 86 97 00 00 48 53 46 5F 5F 5F 5F 30 00 80 19 FF 00 00 FF FF E8 90 05

Obtaining Information from BlueBridge®

Since BlueBridge® version 5.3.0 more support has been added to make it easier for user to obtain the proper control string.

Obtaining necessary parameters from BlueBridge® Designer
To obtain necessary parameters value from BlueBridge® Designer, the following procedure can be used:

- In BlueBridge® Designer, open up the module control page that you want a 3rd party controller to control. Double click on the module to bring up the control page.
- Use a bounding rectangle to high light the control element you want a 3rd party controller to control.
- Once you have highlighted the control element, the component property on the right hand side of the application will display the "Control Parameters" you needed for programming.

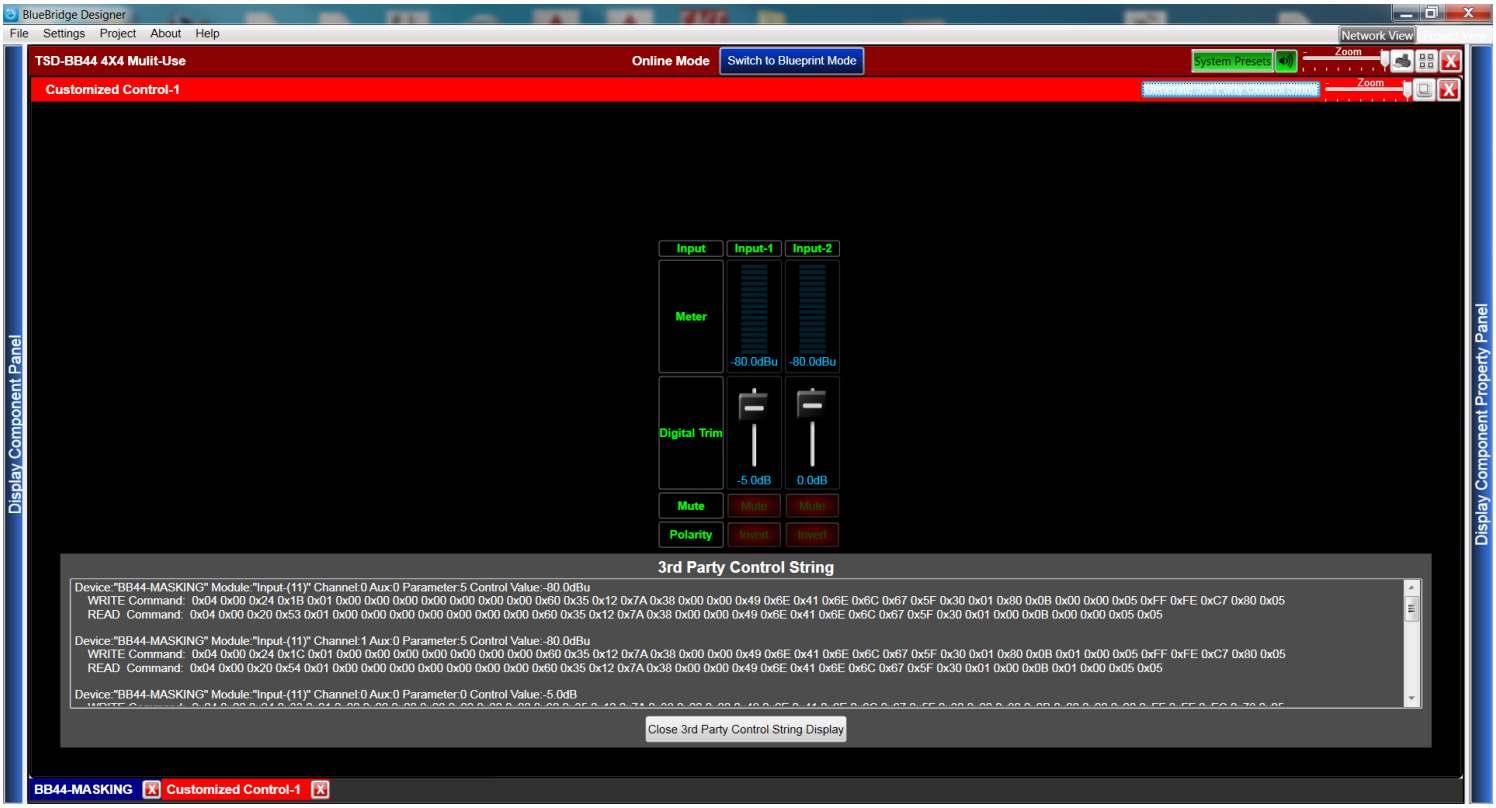


Obtaining exact control string from BlueBridge® Designer
A new feature has been added to BlueBridge® Designer to help build the control string.

In the Project, bring in a "Custom Control Screen" element from the component list on the left hand side. This "Custom Control Screen" is very similar to the BluePanel PC except it can only run inside BlueBridge® Designer. For items that need to be controlled by 3rd Party Controller, drag and drop it into this control page. After pulling in all the required control items, bring the project ONLINE.

In ONLINE mode, this "Custom Control Screen" will work like a control panel within the design. Under ONLINE mode, there is a button "Generate 3rd Party Control String" appear on the title bar. Press this button and the bottom part of the control screen will display all the control strings (Including WRITE and READ command). Copy and paste these strings to the control program.

The generated string will depends on the control point value that will be send to the device. (Example if the fader is to be set to -5dB, adjust the fader on screen to the -5dB value, and then click the "Generate 3rd Party Control String" button again. The string value will be updated.



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