Technical Specification

Third Party Control Protocol

AV Revolution

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DISCLAIMER

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1 INTRODUCTION

1.1 OVERVIEW

AV Revolution supports third party control via the Ethernet port using the UDP network protocol.

This protocol is used by the Revolution driver modules for both Crestron and AMX provided by Australian Monitor and also by the Revolution iPad applications.

The dedicated Revolution PC software applications use a different protocol when communicating with Revolution hardware.

1.2 COMMUNICATIONS METHOD

Connectionless sockets (the User Datagram Protocol, or UDP) are used for transferring data between third party systems and Revolution products.

Revolution listens for UDP messages on port 55556 and issues responses to the originating port address.

Third party systems are free to select a port address other than 55556 as their UDP socket. It is recommended that non-reserved ports above 1024 are used for the third party socket.

In the example below, a third party system issues messages to the Revolution on UDP port 55556 and receives responses from Revolution on UDP port 12345.

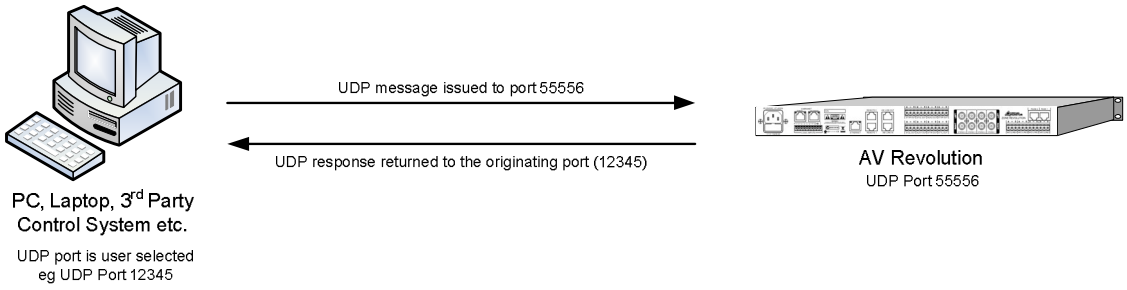


Figure 1. Connection-less UDP Messaging

1.3 OTHER REQUIRMENTS

The third party system and network topology must be configured accordingly so that UDP messages can be successfully transported between the two devices. For non-routed local area networks this means both devices must be on the same subnet address.

For routed networks, the network infrastructure must be suitably configured to route UDP messages between the two devices and the AV Revolution must be configured correctly in terms of the network subnet mask and default gateway settings.

Support for user defined subnet mask and default gateway parameters was implemented in 2012 with the following software and firmware versions.

Software Component	Version
AV Revolution Software GUI	2.20
AV Revolution Firmware	2.17

Table 1. Routed Network Support

2 MESSAGE STRUCTURE

2.1 UDP MESSAGE STRUCTURE

UDP messages comprise the following key blocks.

UDP Message Packet			
Ethernet Protocol	IP Protocol	UDP Protocol	**Revolution Protocol Message**
14 bytes	18 bytes	8 bytes	n bytes

Table 2. UDP Message Structure

The Ethernet, IP and UDP Protocol blocks contain Source and Destination MAC address information, Source and Destination IP address and Port number information.

We are only concerned with the Revolution Protocol Message that follows these blocks.

2.2 REVOLUTION PROTOCOL MESSAGE STRUCTURE

The Revolution Protocol Message comprises a number of message blocks.

Revolution Protocol Message			
Command String	Packet Number	Device Type ID	Command Specific Data
n bytes	2 bytes	2 bytes	n bytes

Table 3. Revolution Message Structure

2.2.1 Command String

Command strings are issues in plain ASCII text.

Refer to section 3 Command Description for detailed description of command strings.

2.2.2 Packet Number

The Packet Number is an optional 16 bit packet number for identification of the corresponding reply packet by the third party system. If you do not wish to use this feature the packet number should be set to 0x0000.

The Packet Number is a 16 bit unsigned value, sent as 2 hexadecimal bytes in Big Endian (Motorola) format.

The tables and examples shown in section 3 Command Description all use a Packet Number of 0x0000 (Unused).

2.2.3 Device Type ID

The Device Type ID is used to identify the hardware device.

The Device Type ID is a 16 bit value, as 2 hexadecimal bytes sent Big Endian (MSB first).

Device ID	Device Type
0x0100	AV Revolution
0x0200	Zone Revolution

Table 4. Device Type ID

Revolution devices only respond to messages with a matching Device Type ID.

Messages issued to a Revolution device with a miss-matching Device Type ID are ignored.

The tables and examples shown in section 3 Command Description all use a Device ID of 0x0100 (AV Revolution).

2.2.4 Parameter ID

The Parameter ID is used with the "GET PAR" and "SET PAR" commands. This 32 bit number specifies the working parameter to be retrieved or modified.

Refer to section 4 Parameter ID Values for a listing of Parameter ID's, covering the following Revolution functions:

i. Main Page functions for each Zone.
ii. Preset recall and store.
iii. Full input setup functions.
iv. Full output setup functions.
v. EQ, Dynamics, Limiter and Delay bypass functions.

Note: The full compliment of DSP Parameter ID's are not listed in this document.

Please contact techsupport@australianmonitor.com.au if you require the concise listing.

2.2.5 Command Specific Data

The command specific data is documented in detail for each command string in the following chapter.

Boolean parameter functions that are OFF or ON such as Bypass, Mute, Phantom and Phase Invert functions are represented as 0 or 1 respectively as an 8 bit value.

Parameter	8 Bit Value
OFF	0x00
ON	0x01

Table 5. Boolean Values

3 COMMAND DESCRIPTION

3.1 COMMAND OVERVIEW

With this protocol, UDP messages always start with a command string, issued in plain ASCII.

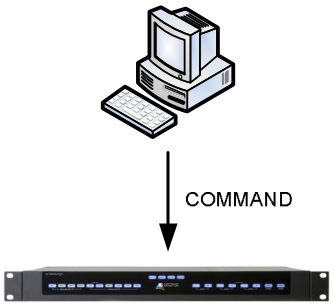
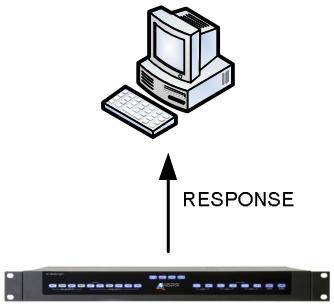
Command Description		
Status Request	GET STATUS	ACK GETSTATUS
Get Parameter Request	GET PAR	ACK GETPAR
Set Parameter Request	SET PAR	ACK SETPAR
Recall Preset	PRE RECALL	ACK PRERECALL

Table 6. Command String Overview

The GET STATUS command used to request status information from the Revolution device

The GET PAR command is used to request parameter data from the Revolution device.

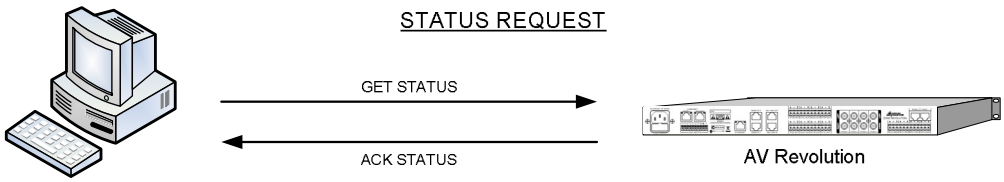
The SET PAR command is used to modify parameter data in the Revolution device.

The PRE RECALL command is used to recall a global preset.

3.2 STATUS REQUEST

The GET STATUS command requests a status response from the Revolution device.

The Revolution device responds with an ACK STATUS message.



The following status information is returned in the Revolution response message.

i. Device Model Identifier
ii. Network Name
iii. Firmware Version Number

Byte	Description	Format	Value
1..10	Command String	ASCII Text	GET STATUS
11..12	Packet Number	Unsigned 16 Bit	0x0000
13..14	Device Type ID	Unsigned 16 Bit	0x0100

Table 7. GET STATUS Request

Byte	Description	Format	Value
1..10	Command String	ASCII Text	ACK STATUS
11..12	Packet Number	Unsigned 16 Bit	0x0000
13..14	Device Type ID	Unsigned 16 Bit	0x0100
15..30	Network Name	ASCII Text	i.e. “AM-0023EC000004” [1]Terminated with 0x00
31..38	Firmware Version	ASCII Text	i.e. “2.17” [2]Terminated with 0x00

Table 8. ACK STATUS Response

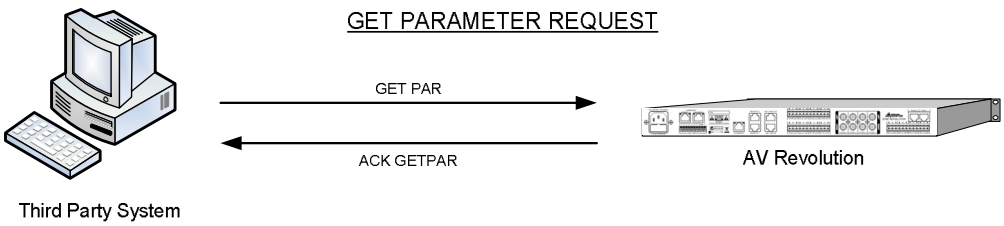
[1] Unused bytes after 0x00 termination are blank padded with space characters (0x20).

[2] Unused bytes after 0x00 termination are blank padded with space characters (0x20).

3.3 GET PARAMETER REQUEST

The GET PAR command requests a list of parameter attributes, by ID from the Revolution device.

The Revolution device responds with an ACK GETPAR message.



When requesting parameters from Revolution, the user must specify the numerical value format (byte 12) the returned data is to be provided. Refer to Table 2. Value Formats for mode details.

A number of Parameters may be requested by a single GET PAR message, although the user must ensure the resulting Ethernet frame does not exceed the maximum frame length constraint.

Byte	Description	Format	Value
1..7	Command String	ASCII Text	GET PAR
8..9	Packet Number	16 Bit	0x0000
10..11	Device Type ID	16 Bit	0x0100
12	Value Format	8 Bit	[3] 0x00 to 0x06
13..16	Parameter 1 ID	32 Bit	[4] Parameter ID
17	[5] Exponent		
…	Parameter 2 ID	32 Bit	Parameter ID
…	Exponent		
…	Parameter X ID	32 Bit	Parameter ID
…	Exponent		
…	End ID	32 bit	0x00000000

Table 9. GET PAR Request

[3] Refer to Table 34. Value Formats for details.

[4] Refer to Section 4 Parameter ID Values for details.

[5] The Exponent byte is only required when specifying Value Formats 4-6, to specify the required exponent.

Byte	Description	Format	Value
1..10	Command String	ASCII Text	ACK GETPAR
11..12	Packet Number	16 Bit	0x0000
13..14	Device Type ID	16 Bit	0x0100
15..16	Error Code	16 Bit	0x0000 = No Error 0x0001 = Undefined Error 0x0002 = Invalid ID found 0x0003 = Invalid Format
17	Value Format	8 Bit	[6] 0x00 to 0x06
18..21	Parameter 1 ID	32 Bit	Parameter ID
22..	Parameter 1 Value		Value bytes, dependant on requested format
…	Parameter 2 ID	32 Bit	…
…	Parameter 2 Value		…
…	Parameter X ID	32 Bit	…
…	Parameter X Value		…

Table 10. ACK GETPAR Response

3.3.1 Example

	Command String							Packet Nr.		Dev ID		Value Format	Parameter ID				End			
Hex	47	45	54	20	50	41	52	00	00	01	00	00	00	0C	00	2C	00	00	00	00
Decoded	G	E	T		P	A	R	0		AV Rev		8 Bit	Zone 1 Master Level				Message End			

Table 11. Example: Request Zone 1 Master Level

Command String										Packet Nr.		Dev ID		Error Code		Value Format	Parameter ID				Value	End			
41	43	4B	20	47	45	54	50	41	52	00	00	01	00	00	00	00	00	0C	00	2C	06	00	00	00	00
A	C	K		G	E	T	P	A	R	0		AV Rev		No Error		8 Bit	Zone 1 Master Level				+6dB	Message End			

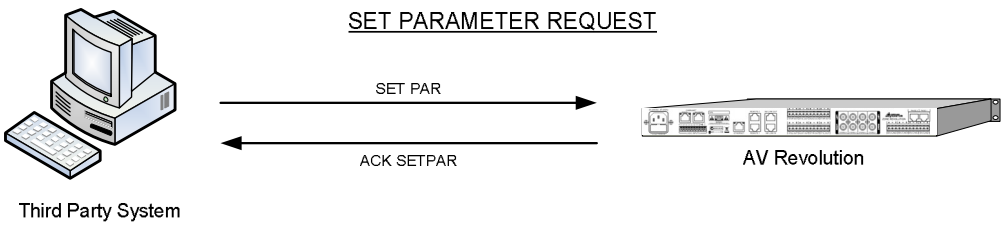
Table 12. Example: Response - Zone 1 Master Level = +6dB

[6] Refer to Table 34. Value Formats for details.

3.4 SET PARAMETER REQUEST

The SET PAR command allows setting a list of parameter values, by ID inside the Revolution device.

The Revolution device responds with an ACK SETPAR message.



When issuing the SET PAR command, the user must specify the numerical value format (byte 12) of the Parameter Values provided in the message. Refer to Table 2. Value Formats for mode details.

A number of Parameters may be set by a single SET PAR message, although the user must ensure the resulting Ethernet frame does not exceed the maximum frame length constraint.

Byte	Description	Format	Value
1..7	Command String	ASCII Text	SET PAR
8..9	Packet Number	16 Bit	0x0000
10..11	Device Type ID	16 Bit	0x0100
12	Value Format	8 Bit	[7] 0x00 to 0x06
13..16	Parameter 1 ID	32 Bit	[8] Parameter ID
17….	Parameter 1 Value		
…	Parameter 2 ID	32 Bit	Parameter ID
…	Parameter 2 Value		
…	Parameter X ID	32 Bit	Parameter ID
…	Parameter X Value		
…	End ID	32 bit	0x00000000

Table 13. SET PAR Request

[7] Refer to Table 34. Value Formats for details.

[8] Refer to Section 4 Parameter ID Values for details.

Byte	Description	Format	Value
1..13	Command String	ASCII Text	ACK SETPAR
14..15	Packet Number	16 Bit	0x0000
16..17	Device Type ID	16 Bit	0x0100
18..19	Error Code	16 Bit	0x0000 = No Error 0x0001 = Undefined Error 0x0002 = Invalid ID found 0x0003 = Invalid Format

Table 14. ACK SETPAR Response

3.4.1 Examples

	Command String							Packet Nr.		Dev ID		Value Format	Parameter ID				Value	End			
Hex	53	45	54	20	50	41	52	00	00	01	00	00	00	0C	00	2C	EC	00	00	00	00
Decoded	S	E	T		P	A	R	0		AV Rev		8 Bit	Zone 1 Master Level				-20	Message End			

Table 15. Example: Set Zone Maser Level to -20dB

	Command String							Packet Nr.		Dev ID		Value Format	Parameter ID				Value	End			
Hex	53	45	54	20	50	41	52	00	00	01	00	00	00	0D	00	0D	01	00	00	00	00
Decoded	S	E	T		P	A	R	0		AV Rev		8 Bit	Zone 2 Mic/Line 3 Mute				ON	Message End			

Table 16. Example: Set Zone 2 Mic/Line 3 Mute On

	Command String							Packet Nr.		Dev ID		Value Format	Parameter ID				Value	End			
Hex	53	45	54	20	50	41	52	00	00	01	00	00	01	B1	00	00	00	00	00	00	00
Decoded	S	E	T		P	A	R	0		AV Rev		8 Bit	Zone 3 Output Delay Right Bypass				OFF	Message End			

Table 17. Example: Set Zone 3 Output Delay Right Bypass

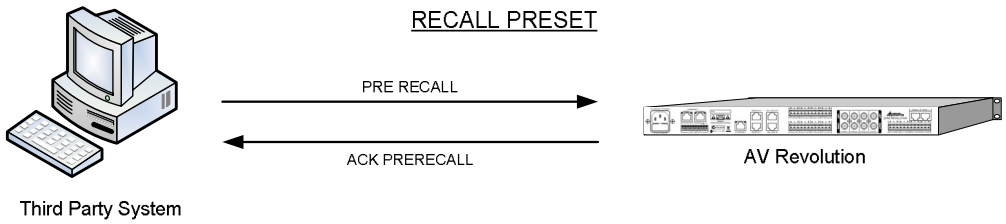
	Command String										Packet Nr.		Dev ID		Error Code	
Hex	53	43	4B	20	47	45	54	50	41	52	00	00	01	00	00	00
Decoded	A	C	K		S	E	T	P	A	R	0		AV Rev		No Error	

Table 18. Example: Response to SET PAR

3.5 RECALL PRESET

The PRE RECALL command recalls a global preset.

The Revolution device responds with an ACK PRERECALL message.



Byte	Description	Format	Value
1..10	Command String	ASCII Text	PRE RECALL
11..12	Packet Number	16 Bit	0x0000
13..14	Device Type ID	16 Bit	0x0100
15	Preset Number	8 Bit	0x00 to 0x08

Table 19. PRE RECALL Request

Byte	Description	Format	Value
1..13	Command String	ASCII Text	ACK PRERECALL
14..15	Packet Number	16 Bit	0x0000
16..17	Device Type ID	16 Bit	0x0100
18..19	Error Code	16 Bit	0x0000 = No Error 0x0001 = Undefined Error 0x0002 = Invalid Preset Number

Table 20. ACK PRERECALL Response

Presets may be stored using the SET PAR command with the Parameter ID for Storing a Preset. Refer to Table 26. Preset Parameters for details.

4 PARAMETER ID VALUES

4.1 MAIN PAGE PARAMETERS - ZONE 1

Main Page - Zone 1	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Zone 1 - Mic/Line 1 - Pan	0x00	0x0C	0x00	0x04	0x000C0004	-100	100
Zone 1 - Mic/Line 1 - Level	0x00	0x0C	0x00	0x00	0x000C0000	-96	12
Zone 1 - Mic/Line 1 - Mute	0x00	0x0C	0x00	0x03	0x000C0003	0	1
Zone 1 - Mic/Line 1 - Min	0x00	0x0C	0x00	0x01	0x000C0001	-96	-24
Zone 1 - Mic/Line 1 - Max	0x00	0x0C	0x00	0x02	0x000C0002	-24	12
Zone 1 - Mic/Line 2 - Pan	0x00	0x0C	0x00	0x09	0x000C0009	-100	100
Zone 1 - Mic/Line 2 - Level	0x00	0x0C	0x00	0x05	0x000C0005	-96	12
Zone 1 - Mic/Line 2 - Mute	0x00	0x0C	0x00	0x08	0x000C0008	0	1
Zone 1 - Mic/Line 2 - Min	0x00	0x0C	0x00	0x06	0x000C0006	-96	-24
Zone 1 - Mic/Line 2 - Max	0x00	0x0C	0x00	0x07	0x000C0007	-24	12
Zone 1 - Mic/Line 3 - Pan	0x00	0x0C	0x00	0x0E	0x000C000E	-100	100
Zone 1 - Mic/Line 3 - Level	0x00	0x0C	0x00	0x0A	0x000C000A	-96	12
Zone 1 - Mic/Line 3 - Mute	0x00	0x0C	0x00	0x0D	0x000C000D	0	1
Zone 1 - Mic/Line 3 - Min	0x00	0x0C	0x00	0x0B	0x000C000B	-96	-24
Zone 1 - Mic/Line 3 - Max	0x00	0x0C	0x00	0x0C	0x000C000C	-24	12
Zone 1 - Mic/Line 4 - Pan	0x00	0x0C	0x00	0x13	0x000C0013	-100	100
Zone 1 - Mic/Line 4 - Level	0x00	0x0C	0x00	0x0F	0x000C000F	-96	12
Zone 1 - Mic/Line 4 - Mute	0x00	0x0C	0x00	0x12	0x000C0012	0	1
Zone 1 - Mic/Line 4 - Min	0x00	0x0C	0x00	0x10	0x000C0010	-96	-24
Zone 1 - Mic/Line 4 - Max	0x00	0x0C	0x00	0x11	0x000C0011	-24	12
Zone 1 - Stereo 1 - Level	0x00	0x0C	0x00	0x14	0x000C0014	-96	12
Zone 1 - Stereo 1 - Mute	0x00	0x0C	0x00	0x17	0x000C0017	0	1
Zone 1 - Stereo 1 - Min	0x00	0x0C	0x00	0x15	0x000C0015	-96	-24
Zone 1 - Stereo 1 - Max	0x00	0x0C	0x00	0x16	0x000C0016	-24	12
Zone 1 - Stereo 2 - Level	0x00	0x0C	0x00	0x18	0x000C0018	-96	12
Zone 1 - Stereo 2 - Mute	0x00	0x0C	0x00	0x1B	0x000C001B	0	1
Zone 1 - Stereo 2 - Min	0x00	0x0C	0x00	0x19	0x000C0019	-96	-24
Zone 1 - Stereo 2 - Max	0x00	0x0C	0x00	0x1A	0x000C001A	-24	12
Zone 1 - Stereo 3 - Level	0x00	0x0C	0x00	0x1C	0x000C001C	-96	12
Zone 1 - Stereo 3 - Mute	0x00	0x0C	0x00	0x1F	0x000C001F	0	1
Zone 1 - Stereo 3 - Min	0x00	0x0C	0x00	0x1D	0x000C001D	-96	-24
Zone 1 - Stereo 3 - Max	0x00	0x0C	0x00	0x1E	0x000C001E	-24	12
Zone 1 - Stereo 4 - Level	0x00	0x0C	0x00	0x20	0x000C0020	-96	12
Zone 1 - Stereo 4 - Mute	0x00	0x0C	0x00	0x23	0x000C0023	0	1
Zone 1 - Stereo 4 - Min	0x00	0x0C	0x00	0x21	0x000C0021	-96	-24
Zone 1 - Stereo 4 - Max	0x00	0x0C	0x00	0x22	0x000C0022	-24	12
Zone 1 - Stereo 5 - Level	0x00	0x0C	0x00	0x24	0x000C0024	-96	12
Zone 1 - Stereo 5 - Mute	0x00	0x0C	0x00	0x27	0x000C0027	0	1
Zone 1 - Stereo 5 - Min	0x00	0x0C	0x00	0x25	0x000C0025	-96	-24
Zone 1 - Stereo 5 - Max	0x00	0x0C	0x00	0x26	0x000C0026	-24	12
Zone 1 - Stereo 6 - Level	0x00	0x0C	0x00	0x28	0x000C0028	-96	12
Zone 1 - Stereo 6 - Mute	0x00	0x0C	0x00	0x2B	0x000C002B	0	1
Zone 1 - Stereo 6 - Min	0x00	0x0C	0x00	0x29	0x000C0029	-96	-24
Zone 1 - Stereo 6 - Max	0x00	0x0C	0x00	0x2A	0x000C002A	-24	12
Zone 1 - Master - Level	0x00	0x0C	0x00	0x2C	0x000C002C	-96	12
Zone 1 - Master - Mute	0x00	0x0C	0x00	0x2F	0x000C002F	0	1
Zone 1 - Master - Min	0x00	0x0C	0x00	0x2D	0x000C002D	-96	-24
Zone 1 - Master - Max	0x00	0x0C	0x00	0x2E	0x000C002E	-24	12
Zone 1 - Master - Mono	0x00	0x0C	0x00	0x32	0x000C0032	0	1

Table 21. Main Page Parameters - Zone 1

4.2 MAIN PAGE PARAMETERS - ZONE 2

Main Page - Zone 2	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Zone 2 - Mic/Line 1 - Pan	0x00	0x0D	0x00	0x04	0x000D0004	-100	100
Zone 2 - Mic/Line 1 - Level	0x00	0x0D	0x00	0x00	0x000D0000	-96	12
Zone 2 - Mic/Line 1 - Mute	0x00	0x0D	0x00	0x03	0x000D0003	0	1
Zone 2 - Mic/Line 1 - Min	0x00	0x0D	0x00	0x01	0x000D0001	-96	-24
Zone 2 - Mic/Line 1 - Max	0x00	0x0D	0x00	0x02	0x000D0002	-24	12
Zone 2 - Mic/Line 2 - Pan	0x00	0x0D	0x00	0x09	0x000D0009	-100	100
Zone 2 - Mic/Line 2 - Level	0x00	0x0D	0x00	0x05	0x000D0005	-96	12
Zone 2 - Mic/Line 2 - Mute	0x00	0x0D	0x00	0x08	0x000D0008	0	1
Zone 2 - Mic/Line 2 - Min	0x00	0x0D	0x00	0x06	0x000D0006	-96	-24
Zone 2 - Mic/Line 2 - Max	0x00	0x0D	0x00	0x07	0x000D0007	-24	12
Zone 2 - Mic/Line 3 - Pan	0x00	0x0D	0x00	0x0E	0x000D000E	-100	100
Zone 2 - Mic/Line 3 - Level	0x00	0x0D	0x00	0x0A	0x000D000A	-96	12
Zone 2 - Mic/Line 3 - Mute	0x00	0x0D	0x00	0x0D	0x000D000D	0	1
Zone 2 - Mic/Line 3 - Min	0x00	0x0D	0x00	0x0B	0x000D000B	-96	-24
Zone 2 - Mic/Line 3 - Max	0x00	0x0D	0x00	0x0C	0x000D000C	-24	12
Zone 2 - Mic/Line 4 - Pan	0x00	0x0D	0x00	0x13	0x000D0013	-100	100
Zone 2 - Mic/Line 4 - Level	0x00	0x0D	0x00	0x0F	0x000D000F	-96	12
Zone 2 - Mic/Line 4 - Mute	0x00	0x0D	0x00	0x12	0x000D0012	0	1
Zone 2 - Mic/Line 4 - Min	0x00	0x0D	0x00	0x10	0x000D0010	-96	-24
Zone 2 - Mic/Line 4 - Max	0x00	0x0D	0x00	0x11	0x000D0011	-24	12
Zone 2 - Stereo 1 - Level	0x00	0x0D	0x00	0x14	0x000D0014	-96	12
Zone 2 - Stereo 1 - Mute	0x00	0x0D	0x00	0x17	0x000D0017	0	1
Zone 2 - Stereo 1 - Min	0x00	0x0D	0x00	0x15	0x000D0015	-96	-24
Zone 2 - Stereo 1 - Max	0x00	0x0D	0x00	0x16	0x000D0016	-24	12
Zone 2 - Stereo 2 - Level	0x00	0x0D	0x00	0x18	0x000D0018	-96	12
Zone 2 - Stereo 2 - Mute	0x00	0x0D	0x00	0x1B	0x000D001B	0	1
Zone 2 - Stereo 2 - Min	0x00	0x0D	0x00	0x19	0x000D0019	-96	-24
Zone 2 - Stereo 2 - Max	0x00	0x0D	0x00	0x1A	0x000D001A	-24	12
Zone 2 - Stereo 3 - Level	0x00	0x0D	0x00	0x1C	0x000D001C	-96	12
Zone 2 - Stereo 3 - Mute	0x00	0x0D	0x00	0x1F	0x000D001F	0	1
Zone 2 - Stereo 3 - Min	0x00	0x0D	0x00	0x1D	0x000D001D	-96	-24
Zone 2 - Stereo 3 - Max	0x00	0x0D	0x00	0x1E	0x000D001E	-24	12
Zone 2 - Stereo 4 - Level	0x00	0x0D	0x00	0x20	0x000D0020	-96	12
Zone 2 - Stereo 4 - Mute	0x00	0x0D	0x00	0x23	0x000D0023	0	1
Zone 2 - Stereo 4 - Min	0x00	0x0D	0x00	0x21	0x000D0021	-96	-24
Zone 2 - Stereo 4 - Max	0x00	0x0D	0x00	0x22	0x000D0022	-24	12
Zone 2 - Stereo 5 - Level	0x00	0x0D	0x00	0x24	0x000D0024	-96	12
Zone 2 - Stereo 5 - Mute	0x00	0x0D	0x00	0x27	0x000D0027	0	1
Zone 2 - Stereo 5 - Min	0x00	0x0D	0x00	0x25	0x000D0025	-96	-24
Zone 2 - Stereo 5 - Max	0x00	0x0D	0x00	0x26	0x000D0026	-24	12
Zone 2 - Stereo 6 - Level	0x00	0x0D	0x00	0x28	0x000D0028	-96	12
Zone 2 - Stereo 6 - Mute	0x00	0x0D	0x00	0x2B	0x000D002B	0	1
Zone 2 - Stereo 6 - Min	0x00	0x0D	0x00	0x29	0x000D0029	-96	-24
Zone 2 - Stereo 6 - Max	0x00	0x0D	0x00	0x2A	0x000D002A	-24	12
Zone 2 - Master - Level	0x00	0x0D	0x00	0x2C	0x000D002C	-96	12
Zone 2 - Master - Mute	0x00	0x0D	0x00	0x2F	0x000D002F	0	1
Zone 2 - Master - Min	0x00	0x0D	0x00	0x2D	0x000D002D	-96	-24
Zone 2 - Master - Max	0x00	0x0D	0x00	0x2E	0x000D002E	-24	12
Zone 2 - Master - Mono	0x00	0x0D	0x00	0x32	0x000D0032	0	1

Table 22. Main Page Parameters - Zone 2

4.3 MAIN PAGE PARAMETERS - ZONE 3

Main Page - Zone 3	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Zone 3 - Mic/Line 1 - Level	0x00	0x0E	0x00	0x00	0x000E0000	-96	12
Zone 3 - Mic/Line 1 - Mute	0x00	0x0E	0x00	0x03	0x000E0003	0	1
Zone 3 - Mic/Line 1 - Min	0x00	0x0E	0x00	0x01	0x000E0001	-96	-24
Zone 3 - Mic/Line 1 - Max	0x00	0x0E	0x00	0x02	0x000E0002	-24	12
Zone 3 - Mic/Line 2 - Pan	0x00	0x0E	0x00	0x09	0x000E0009	-100	100
Zone 3 - Mic/Line 2 - Level	0x00	0x0E	0x00	0x05	0x000E0005	-96	12
Zone 3 - Mic/Line 2 - Mute	0x00	0x0E	0x00	0x08	0x000E0008	0	1
Zone 3 - Mic/Line 2 - Min	0x00	0x0E	0x00	0x06	0x000E0006	-96	-24
Zone 3 - Mic/Line 2 - Max	0x00	0x0E	0x00	0x07	0x000E0007	-24	12
Zone 3 - Mic/Line 3 - Pan	0x00	0x0E	0x00	0x0E	0x000E000E	-100	100
Zone 3 - Mic/Line 3 - Level	0x00	0x0E	0x00	0x0A	0x000E000A	-96	12
Zone 3 - Mic/Line 3 - Mute	0x00	0x0E	0x00	0x0D	0x000E000D	0	1
Zone 3 - Mic/Line 3 - Min	0x00	0x0E	0x00	0x0B	0x000E000B	-96	-24
Zone 3 - Mic/Line 3 - Max	0x00	0x0E	0x00	0x0C	0x000E000C	-24	12
Zone 3 - Mic/Line 4 - Pan	0x00	0x0E	0x00	0x13	0x000E0013	-100	100
Zone 3 - Mic/Line 4 - Level	0x00	0x0E	0x00	0x0F	0x000E000F	-96	12
Zone 3 - Mic/Line 4 - Mute	0x00	0x0E	0x00	0x12	0x000E0012	0	1
Zone 3 - Mic/Line 4 - Min	0x00	0x0E	0x00	0x10	0x000E0010	-96	-24
Zone 3 - Mic/Line 4 - Max	0x00	0x0E	0x00	0x11	0x000E0011	-24	12
Zone 3 - Stereo 1 - Level	0x00	0x0E	0x00	0x14	0x000E0014	-96	12
Zone 3 - Stereo 1 - Mute	0x00	0x0E	0x00	0x17	0x000E0017	0	1
Zone 3 - Stereo 1 - Min	0x00	0x0E	0x00	0x15	0x000E0015	-96	-24
Zone 3 - Stereo 1 - Max	0x00	0x0E	0x00	0x16	0x000E0016	-24	12
Zone 3 - Stereo 2 - Level	0x00	0x0E	0x00	0x18	0x000E0018	-96	12
Zone 3 - Stereo 2 - Mute	0x00	0x0E	0x00	0x1B	0x000E001B	0	1
Zone 3 - Stereo 2 - Min	0x00	0x0E	0x00	0x19	0x000E0019	-96	-24
Zone 3 - Stereo 2 - Max	0x00	0x0E	0x00	0x1A	0x000E001A	-24	12
Zone 3 - Stereo 3 - Level	0x00	0x0E	0x00	0x1C	0x000E001C	-96	12
Zone 3 - Stereo 3 - Mute	0x00	0x0E	0x00	0x1F	0x000E001F	0	1
Zone 3 - Stereo 3 - Min	0x00	0x0E	0x00	0x1D	0x000E001D	-96	-24
Zone 3 - Stereo 3 - Max	0x00	0x0E	0x00	0x1E	0x000E001E	-24	12
Zone 3 - Stereo 4 - Level	0x00	0x0E	0x00	0x20	0x000E0020	-96	12
Zone 3 - Stereo 4 - Mute	0x00	0x0E	0x00	0x23	0x000E0023	0	1
Zone 3 - Stereo 4 - Min	0x00	0x0E	0x00	0x21	0x000E0021	-96	-24
Zone 3 - Stereo 4 - Max	0x00	0x0E	0x00	0x22	0x000E0022	-24	12
Zone 3 - Stereo 5 - Level	0x00	0x0E	0x00	0x24	0x000E0024	-96	12
Zone 3 - Stereo 5 - Mute	0x00	0x0E	0x00	0x27	0x000E0027	0	1
Zone 3 - Stereo 5 - Min	0x00	0x0E	0x00	0x25	0x000E0025	-96	-24
Zone 3 - Stereo 5 - Max	0x00	0x0E	0x00	0x26	0x000E0026	-24	12
Zone 3 - Stereo 6 - Level	0x00	0x0E	0x00	0x28	0x000E0028	-96	12
Zone 3 - Stereo 6 - Mute	0x00	0x0E	0x00	0x2B	0x000E002B	0	1
Zone 3 - Stereo 6 - Min	0x00	0x0E	0x00	0x29	0x000E0029	-96	-24
Zone 3 - Stereo 6 - Max	0x00	0x0E	0x00	0x2A	0x000E002A	-24	12
Zone 3 - Master - Level	0x00	0x0E	0x00	0x2C	0x000E002C	-96	12
Zone 3 - Master - Mute	0x00	0x0E	0x00	0x2F	0x000E002F	0	1
Zone 3 - Master - Min	0x00	0x0E	0x00	0x2D	0x000E002D	-96	-24
Zone 3 - Master - Max	0x00	0x0E	0x00	0x2E	0x000E002E	-24	12
Zone 3 - Master - Mono	0x00	0x0E	0x00	0x32	0x000E0032	0	1

Table 23. Main Page Parameters - Zone 3

4.4 MAIN PAGE PARAMETERS - ZONE 4

Main Page - Zone 4	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Zone 4 - Mic/Line 1 - Level	0x00	0x0F	0x00	0x00	0x000F0000	-96	12
Zone 4 - Mic/Line 1 - Mute	0x00	0x0F	0x00	0x03	0x000F0003	0	1
Zone 4 - Mic/Line 1 - Min	0x00	0x0F	0x00	0x01	0x000F0001	-96	-24
Zone 4 - Mic/Line 1 - Max	0x00	0x0F	0x00	0x02	0x000F0002	-24	12
Zone 4 - Mic/Line 2 - Level	0x00	0x0F	0x00	0x05	0x000F0005	-96	12
Zone 4 - Mic/Line 2 - Mute	0x00	0x0F	0x00	0x08	0x000F0008	0	1
Zone 4 - Mic/Line 2 - Min	0x00	0x0F	0x00	0x06	0x000F0006	-96	-24
Zone 4 - Mic/Line 2 - Max	0x00	0x0F	0x00	0x07	0x000F0007	-24	12
Zone 4 - Mic/Line 3 - Level	0x00	0x0F	0x00	0x0A	0x000F000A	-96	12
Zone 4 - Mic/Line 3 - Mute	0x00	0x0F	0x00	0x0D	0x000F000D	0	1
Zone 4 - Mic/Line 3 - Min	0x00	0x0F	0x00	0x0B	0x000F000B	-96	-24
Zone 4 - Mic/Line 3 - Max	0x00	0x0F	0x00	0x0C	0x000F000C	-24	12
Zone 4 - Mic/Line 4 - Level	0x00	0x0F	0x00	0x0F	0x000F000F	-96	12
Zone 4 - Mic/Line 4 - Mute	0x00	0x0F	0x00	0x12	0x000F0012	0	1
Zone 4 - Mic/Line 4 - Min	0x00	0x0F	0x00	0x10	0x000F0010	-96	-24
Zone 4 - Mic/Line 4 - Max	0x00	0x0F	0x00	0x11	0x000F0011	-24	12
Zone 4 - Stereo 1 - Level	0x00	0x0F	0x00	0x14	0x000F0014	-96	12
Zone 4 - Stereo 1 - Mute	0x00	0x0F	0x00	0x17	0x000F0017	0	1
Zone 4 - Stereo 1 - Min	0x00	0x0F	0x00	0x15	0x000F0015	-96	-24
Zone 4 - Stereo 1 - Max	0x00	0x0F	0x00	0x16	0x000F0016	-24	12
Zone 4 - Stereo 2 - Level	0x00	0x0F	0x00	0x18	0x000F0018	-96	12
Zone 4 - Stereo 2 - Mute	0x00	0x0F	0x00	0x1B	0x000F001B	0	1
Zone 4 - Stereo 2 - Min	0x00	0x0F	0x00	0x19	0x000F0019	-96	-24
Zone 4 - Stereo 2 - Max	0x00	0x0F	0x00	0x1A	0x000F001A	-24	12
Zone 4 - Stereo 3 - Level	0x00	0x0F	0x00	0x1C	0x000F001C	-96	12
Zone 4 - Stereo 3 - Mute	0x00	0x0F	0x00	0x1F	0x000F001F	0	1
Zone 4 - Stereo 3 - Min	0x00	0x0F	0x00	0x1D	0x000F001D	-96	-24
Zone 4 - Stereo 3 - Max	0x00	0x0F	0x00	0x1E	0x000F001E	-24	12
Zone 4 - Stereo 4 - Level	0x00	0x0F	0x00	0x20	0x000F0020	-96	12
Zone 4 - Stereo 4 - Mute	0x00	0x0F	0x00	0x23	0x000F0023	0	1
Zone 4 - Stereo 4 - Min	0x00	0x0F	0x00	0x21	0x000F0021	-96	-24
Zone 4 - Stereo 4 - Max	0x00	0x0F	0x00	0x22	0x000F0022	-24	12
Zone 4 - Stereo 5 - Level	0x00	0x0F	0x00	0x24	0x000F0024	-96	12
Zone 4 - Stereo 5 - Mute	0x00	0x0F	0x00	0x27	0x000F0027	0	1
Zone 4 - Stereo 5 - Min	0x00	0x0F	0x00	0x25	0x000F0025	-96	-24
Zone 4 - Stereo 5 - Max	0x00	0x0F	0x00	0x26	0x000F0026	-24	12
Zone 4 - Stereo 6 - Level	0x00	0x0F	0x00	0x28	0x000F0028	-96	12
Zone 4 - Stereo 6 - Mute	0x00	0x0F	0x00	0x2B	0x000F002B	0	1
Zone 4 - Stereo 6 - Min	0x00	0x0F	0x00	0x29	0x000F0029	-96	-24
Zone 4 - Stereo 6 - Max	0x00	0x0F	0x00	0x2A	0x000F002A	-24	12
Zone 4 - Master - Level	0x00	0x0F	0x00	0x2C	0x000F002C	-96	12
Zone 4 - Master - Mute	0x00	0x0F	0x00	0x2F	0x000F002F	0	1
Zone 4 - Master - Min	0x00	0x0F	0x00	0x2D	0x000F002D	-96	-24
Zone 4 - Master - Max	0x00	0x0F	0x00	0x2E	0x000F002E	-24	12

Table 24. Main Page Parameters - Zone 4

4.5 MAIN PAGE PARAMETERS - ZONE 5

Main Page - Zone 5	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Zone 5 - Mic/Line 1 - Level	0x00	0x10	0x00	0x00	0x00100000	-96	12
Zone 5 - Mic/Line 1 - Mute	0x00	0x10	0x00	0x03	0x00100003	0	1
Zone 5 - Mic/Line 1 - Min	0x00	0x10	0x00	0x01	0x00100001	-96	-24
Zone 5 - Mic/Line 1 - Max	0x00	0x10	0x00	0x02	0x00100002	-24	12
Zone 5 - Mic/Line 2 - Level	0x00	0x10	0x00	0x05	0x00100005	-96	12
Zone 5 - Mic/Line 2 - Mute	0x00	0x10	0x00	0x08	0x00100008	0	1
Zone 5 - Mic/Line 2 - Min	0x00	0x10	0x00	0x06	0x00100006	-96	-24
Zone 5 - Mic/Line 2 - Max	0x00	0x10	0x00	0x07	0x00100007	-24	12
Zone 5 - Mic/Line 3 - Level	0x00	0x10	0x00	0x0A	0x0010000A	-96	12
Zone 5 - Mic/Line 3 - Mute	0x00	0x10	0x00	0x0D	0x0010000D	0	1
Zone 5 - Mic/Line 3 - Min	0x00	0x10	0x00	0x0B	0x0010000B	-96	-24
Zone 5 - Mic/Line 3 - Max	0x00	0x10	0x00	0x0C	0x0010000C	-24	12
Zone 5 - Mic/Line 4 - Level	0x00	0x10	0x00	0x0F	0x0010000F	-96	12
Zone 5 - Mic/Line 4 - Mute	0x00	0x10	0x00	0x12	0x00100012	0	1
Zone 5 - Mic/Line 4 - Min	0x00	0x10	0x00	0x10	0x00100010	-96	-24
Zone 5 - Mic/Line 4 - Max	0x00	0x10	0x00	0x11	0x00100011	-24	12
Zone 5 - Stereo 1 - Level	0x00	0x10	0x00	0x14	0x00100014	-96	12
Zone 5 - Stereo 1 - Mute	0x00	0x10	0x00	0x17	0x00100017	0	1
Zone 5 - Stereo 1 - Min	0x00	0x10	0x00	0x15	0x00100015	-96	-24
Zone 5 - Stereo 1 - Max	0x00	0x10	0x00	0x16	0x00100016	-24	12
Zone 5 - Stereo 2 - Level	0x00	0x10	0x00	0x18	0x00100018	-96	12
Zone 5 - Stereo 2 - Mute	0x00	0x10	0x00	0x1B	0x0010001B	0	1
Zone 5 - Stereo 2 - Min	0x00	0x10	0x00	0x19	0x00100019	-96	-24
Zone 5 - Stereo 2 - Max	0x00	0x10	0x00	0x1A	0x0010001A	-24	12
Zone 5 - Stereo 3 - Level	0x00	0x10	0x00	0x1C	0x0010001C	-96	12
Zone 5 - Stereo 3 - Mute	0x00	0x10	0x00	0x1F	0x0010001F	0	1
Zone 5 - Stereo 3 - Min	0x00	0x10	0x00	0x1D	0x0010001D	-96	-24
Zone 5 - Stereo 3 - Max	0x00	0x10	0x00	0x1E	0x0010001E	-24	12
Zone 5 - Stereo 4 - Level	0x00	0x10	0x00	0x20	0x00100020	-96	12
Zone 5 - Stereo 4 - Mute	0x00	0x10	0x00	0x23	0x00100023	0	1
Zone 5 - Stereo 4 - Min	0x00	0x10	0x00	0x21	0x00100021	-96	-24
Zone 5 - Stereo 4 - Max	0x00	0x10	0x00	0x22	0x00100022	-24	12
Zone 5 - Stereo 5 - Level	0x00	0x10	0x00	0x24	0x00100024	-96	12
Zone 5 - Stereo 5 - Mute	0x00	0x10	0x00	0x27	0x00100027	0	1
Zone 5 - Stereo 5 - Min	0x00	0x10	0x00	0x25	0x00100025	-96	-24
Zone 5 - Stereo 5 - Max	0x00	0x10	0x00	0x26	0x00100026	-24	12
Zone 5 - Stereo 6 - Level	0x00	0x10	0x00	0x28	0x00100028	-96	12
Zone 5 - Stereo 6 - Mute	0x00	0x10	0x00	0x2B	0x0010002B	0	1
Zone 5 - Stereo 6 - Min	0x00	0x10	0x00	0x29	0x00100029	-96	-24
Zone 5 - Stereo 6 - Max	0x00	0x10	0x00	0x2A	0x0010002A	-24	12
Zone 5 - Master - Level	0x00	0x10	0x00	0x2C	0x0010002C	-96	12
Zone 5 - Master - Mute	0x00	0x10	0x00	0x2F	0x0010002F	0	1
Zone 5 - Master - Min	0x00	0x10	0x00	0x2D	0x0010002D	-96	-24
Zone 5 - Master - Max	0x00	0x10	0x00	0x2E	0x0010002E	-24	12

Table 25. Main Page Parameters - Zone 5

4.6 PRESETS

Presets	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Presets - Recall	0x00	0x05	0x00	0x01	0x00050001	0	8
Presets - Store	0x00	0x05	0x00	0x00	0x00050000	0	8

Table 26. Preset Parameters

4.7 AUDIO SETUP - INPUT BLOCK

Setup - Input Block	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Mic/Line 1 - Input - Level	0x00	0x15	0x00	0x06	0x00150006	-96	12
Mic/Line 1 - Input - Mute	0x00	0x15	0x00	0x05	0x00150005	0	1
Mic/Line 1 - Input - Phantom Power	0x00	0x15	0x00	0x04	0x00150004	0	1
Mic/Line 2 - Input - Level	0x00	0x16	0x00	0x06	0x00160006	-96	12
Mic/Line 2 - Input - Mute	0x00	0x16	0x00	0x05	0x00160005	0	1
Mic/Line 2 - Input - Phantom Power	0x00	0x16	0x00	0x04	0x00160004	0	1
Mic/Line 3 - Input - Level	0x00	0x17	0x00	0x06	0x00170006	-96	12
Mic/Line 3 - Input - Mute	0x00	0x17	0x00	0x05	0x00170005	0	1
Mic/Line 3 - Input - Phantom Power	0x00	0x17	0x00	0x04	0x00170004	0	1
Mic/Line 4 - Input - Level	0x00	0x18	0x00	0x06	0x00180006	-96	12
Mic/Line 4 - Input - Mute	0x00	0x18	0x00	0x05	0x00180005	0	1
Mic/Line 4 - Input - Phantom Power	0x00	0x18	0x00	0x04	0x00180004	0	1
Stereo 1 - Input - Level	0x00	0x1F	0x00	0x01	0x001F0001	-96	12
Stereo 1 - Input - Mute	0x00	0x1F	0x00	0x00	0x001F0000	0	1
Stereo 1 - Input - Invert Left	0x00	0x1F	0x00	0x02	0x001F0002	0	1
Stereo 1 - Input - Invert Right	0x00	0x1F	0x00	0x03	0x001F0003	0	1
Stereo 2 - Input - Level	0x00	0x20	0x00	0x01	0x00200001	-96	12
Stereo 2 - Input - Mute	0x00	0x20	0x00	0x00	0x00200000	0	1
Stereo 2 - Input - Invert Left	0x00	0x20	0x00	0x02	0x00200002	0	1
Stereo 2 - Input - Invert Right	0x00	0x20	0x00	0x03	0x00200003	0	1
Stereo 3 - Input - Level	0x00	0x21	0x00	0x01	0x00210001	-96	12
Stereo 3 - Input - Mute	0x00	0x21	0x00	0x00	0x00210000	0	1
Stereo 3 - Input - Invert Left	0x00	0x21	0x00	0x02	0x00210002	0	1
Stereo 3 - Input - Invert Right	0x00	0x21	0x00	0x03	0x00210003	0	1
Stereo 4 - Input - Level	0x00	0x22	0x00	0x01	0x00220001	-96	12
Stereo 4 - Input - Mute	0x00	0x22	0x00	0x00	0x00220000	0	1
Stereo 4 - Input - Invert Left	0x00	0x22	0x00	0x02	0x00220002	0	1
Stereo 4 - Input - Invert Right	0x00	0x22	0x00	0x03	0x00220003	0	1
Stereo 5 - Input - Level	0x00	0x23	0x00	0x01	0x00230001	-96	12
Stereo 5 - Input - Mute	0x00	0x23	0x00	0x00	0x00230000	0	1
Stereo 5 - Input - Invert Left	0x00	0x23	0x00	0x02	0x00230002	0	1
Stereo 5 - Input - Invert Right	0x00	0x23	0x00	0x03	0x00230003	0	1
Stereo 6 - Input - Level	0x00	0x24	0x00	0x01	0x00240001	-96	12
Stereo 6 - Input - Mute	0x00	0x24	0x00	0x00	0x00240000	0	1
Stereo 6 - Input - Invert Left	0x00	0x24	0x00	0x02	0x00240002	0	1
Stereo 6 - Input - Invert Right	0x00	0x24	0x00	0x03	0x00240003	0	1

Table 27. Audio Setup Parameters - Input Block

4.8 AUDIO SETUP - INPUT EQ

Setup - Input EQ	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Mic/Line 1 - EQ - Bypass	0x00	0x29	0x00	0x00	0x00290000	0	1
Mic/Line 2 - EQ - Bypass	0x00	0x33	0x00	0x00	0x00330000	0	1
Mic/Line 3 - EQ - Bypass	0x00	0x3D	0x00	0x00	0x003D0000	0	1
Mic/Line 4 - EQ - Bypass	0x00	0x47	0x00	0x00	0x00470000	0	1
Stereo 1 - EQ - Bypass	0x00	0x51	0x00	0x00	0x00510000	0	1
Stereo 2 - EQ - Bypass	0x00	0x5B	0x00	0x00	0x005B0000	0	1
Stereo 3 - EQ - Bypass	0x00	0x65	0x00	0x00	0x00650000	0	1
Stereo 4 - EQ - Bypass	0x00	0x6F	0x00	0x00	0x006F0000	0	1
Stereo 5 - EQ - Bypass	0x00	0x79	0x00	0x00	0x00790000	0	1
Stereo 6 - EQ - Bypass	0x00	0x83	0x00	0x00	0x00830000	0	1

Table 28. Audio Setup Parameters - Input Block

4.9 AUDIO SETUP - INPUT DYNAMICS

Setup - Input Dynamics	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Mic/Line 1 - Dynamics - Bypass	0x00	0x97	0x00	0x00	0x00970000	0	1
Mic/Line 2 - Dynamics - Bypass	0x00	0xA1	0x00	0x00	0x00A10000	0	1
Mic/Line 3 - Dynamics - Bypass	0x00	0xAB	0x00	0x00	0x00AB0000	0	1
Mic/Line 4 - Dynamics - Bypass	0x00	0xB5	0x00	0x00	0x00B50000	0	1
Stereo 1 - Dynamics - Bypass	0x00	0xBF	0x00	0x00	0x00BF0000	0	1
Stereo 2 - Dynamics - Bypass	0x00	0xC9	0x00	0x00	0x00C90000	0	1
Stereo 3 - Dynamics - Bypass	0x00	0xD3	0x00	0x00	0x00D30000	0	1
Stereo 4 - Dynamics - Bypass	0x00	0xDD	0x00	0x00	0x00DD0000	0	1
Stereo 5 - Dynamics - Bypass	0x00	0xE7	0x00	0x00	0x00E70000	0	1
Stereo 6 - Dynamics - Bypass	0x00	0xF1	0x00	0x00	0x00F10000	0	1

Table 29. Audio Setup Parameters - Input Dynamics

4.10 AUDIO SETUP - OUTPUT EQ

Setup - Output EQ	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Zone 1 - Crossover / EQ - Bypass Left	0x00	0xFC	0x00	0x00	0x00FC0000	0	1
Zone 1 - Crossover / EQ - Bypass Right	0x01	0x10	0x00	0x00	0x01100000	0	1
Zone 2 - Crossover / EQ - Bypass Left	0x01	0x2E	0x00	0x00	0x012E0000	0	1
Zone 2 - Crossover / EQ - Bypass Right	0x01	0x42	0x00	0x00	0x01420000	0	1
Zone 3 - Crossover / EQ - Bypass Left	0x01	0x60	0x00	0x00	0x01600000	0	1
Zone 3 - Crossover / EQ - Bypass Right	0x01	0x74	0x00	0x00	0x01740000	0	1
Zone 4 - Crossover / EQ - Bypass	0x01	0xCD	0x00	0x00	0x01CD0000	0	1
Zone 5 - Crossover / EQ - Bypass	0x01	0xE1	0x00	0x00	0x01E10000	0	1

Table 30. Audio Setup Parameters - Input EQ

4.11 AUDIO SETUP - OUTPUT LIMITER

Setup - Output Limiter	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Zone 1 - Limiter - Left Bypass	0x01	0x92	0x00	0x05	0x01920005	0	1
Zone 1 - Limiter - Right Bypass	0x01	0x93	0x00	0x05	0x01930005	0	1
Zone 2 - Limiter - Left Bypass	0x01	0x97	0x00	0x05	0x01970005	0	1
Zone 2 - Limiter - Right Bypass	0x01	0x98	0x00	0x05	0x01980005	0	1
Zone 3 - Limiter - Left Bypass	0x01	0x9C	0x00	0x05	0x019C0005	0	1
Zone 3 - Limiter - Right Bypass	0x01	0x9D	0x00	0x05	0x019D0005	0	1
Zone 4 - Limiter - Bypass	0x01	0xF5	0x00	0x00	0x01F50000	0	1
Zone 5 - Limiter - Bypass	0x01	0xF6	0x00	0x00	0x01F60000	0	1

Table 31. Audio Setup Parameters - Output Limiter

4.12 AUDIO SETUP - OUTPUT DELAY

Setup - Output Delay	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Zone 1 - Delay - Left Bypass	0x01	0xA6	0x00	0x00	0x01A60000	0	1
Zone 1 - Delay - Right Bypass	0x01	0xA7	0x00	0x00	0x01A70000	0	1
Zone 2 - Delay - Left Bypass	0x01	0xAB	0x00	0x00	0x01AB0000	0	1
Zone 2 - Delay - Right Bypass	0x01	0xAC	0x00	0x00	0x01AC0000	0	1
Zone 3 - Delay - Left Bypass	0x01	0xB0	0x00	0x00	0x01B00000	0	1
Zone 3 - Delay - Right Bypass	0x01	0xB1	0x00	0x00	0x01B10000	0	1
Zone 4 - Delay - Bypass	0x01	0xFF	0x00	0x00	0x01FF0000	0	1
Zone 5 - Delay - Bypass	0x02	0x04	0x00	0x00	0x02040000	0	1

Table 32. Audio Setup Parameters - Output Delay

4.13 AUDIO SETUP - OUTPUT BLOCK

Setup - Output Block	Parameter ID					Value Range	
	Byte 1	Byte 2	Byte 3	Byte 4	Bytes 1..4	Minimum	Maximum
Zone 1 - Output - Left Level	0x01	0xBA	0x00	0x00	0x01BA0000	-96	0
Zone 1 - Output - Left Mute	0x01	0xBA	0x00	0x01	0x01BA0001	0	1
Zone 1 - Output - Right Level	0x01	0xBB	0x00	0x00	0x01BB0000	-96	0
Zone 1 - Output - Right Mute	0x01	0xBB	0x00	0x01	0x01BB0001	0	1
Zone 2 - Output - Left Level	0x01	0xBF	0x00	0x00	0x01BF0000	-96	0
Zone 2 - Output - Left Mute	0x01	0xBF	0x00	0x01	0x01BF0001	0	1
Zone 2 - Output - Right Level	0x01	0xC0	0x00	0x00	0x01C00000	-96	0
Zone 2 - Output - Right Mute	0x01	0xC0	0x00	0x01	0x01C00001	0	1
Zone 3 - Output - Left Level	0x01	0xC4	0x00	0x00	0x01C40000	-96	0
Zone 3 - Output - Left Mute	0x01	0xC4	0x00	0x01	0x01C40001	0	1
Zone 3 - Output - Right Level	0x01	0xC5	0x00	0x00	0x01C50000	-96	0
Zone 3 - Output - Right Mute	0x01	0xC5	0x00	0x01	0x01C50001	0	1
Zone 4 - Output - Level	0x02	0x09	0x00	0x00	0x02090000	-96	0
Zone 4 - Output - Mute	0x02	0x09	0x00	0x01	0x02090001	0	1
Zone 5 - Output - Level	0x02	0x0E	0x00	0x00	0x020E0000	-96	0
Zone 5 - Output - Mute	0x02	0x0E	0x00	0x01	0x020E0001	0	1

Table 33. Audio Setup Parameters - Output Block

5 NUMBER FORMATS

5.1 OVERVIEW

All parameter data sent to and returned from the Revolution device is sent in binary format, as 8 bit, 16 bit or 32 bit signed values.

All 16 Bit and 32 Bit integer values are transferred Big Endian (MSB first).

Some commands support different "value format" types providing more flexibility.

Format	Bytes	Description	Range	Precision
0x00	1	Signed 8 Bit	-128…+127	1
0x01	2	Signed 16 Bit	-32768…+32767	1
0x02	4	Signed 32 Bit	-2147483648…+2147483647	1
0x03	4	Floating Point 32 Bit	$\approx +/-1{,}401 \cdot 10^{-45}$ … $+/-3{,}403 \cdot 10^{38}$	$1 * 2^{Exponent}$
0x04	2	Signed 8 Bit with Exponent	$\approx +/- 1 * 10^{-128}$ … $+/- 127 * 10^{+127}$	$1 * 10^{Exponent}$
0x05	3	Signed 16 Bit with Exponent	$\approx +/- 1 * 10^{-128}$ … $+/- 32767 * 10^{+127}$	$1 * 10^{Exponent}$
0x06	5	Signed 32 Bit with Exponent	$\approx +/-1 * 10^{-128}$ … $+/- 2147483647 * 10^{+127}$	$1 * 10^{Exponent}$

Table 34. Value Formats

Note: All hexadecimal numbers shown in this document are prefixed with 0x, eg 0xF5. All other number are in decimal format.

Formats 0x00 to 0x02 are 2's compliment signed values.

Refer to section 6 Decimal to Signed Conversion Tables for easy conversion to and from decimal and signed values.

Generally the 8 Bit signed format (format 0x00) will suffice for most applications.

5.2 NUMERICAL FORMAT STRUCTURE

Byte	Description	Comment
0	8 Bit Value	Bit 7..0

Example: -123 = 0x85

Table 35. Format 0 - Signed 8 Bit

Byte	Description	Comment
0	8 Bit MSB	Bit 15..8
1	8 Bit LSB	Bit 7..0

Example: -23568 = 0xA3F0

Table 36. Format 1 - Signed 16 Bit

Byte	Description	Comment
0	8 Bit MSB2	Bit 31..24
1	8 Bit MSB1	Bit 23..16
2	8 Bit LSB2	Bit 15..8
3	8 Bit LSB1	Bit 7..0

Example: -2123535796 = 0xFE9295B4

Table 37. Format 2 - Signed 32 Bit

Byte	Description	Comment
0	8 Bit MSB2	Bit 31..24
1	8 Bit MSB1	Bit 23..16
2	8 Bit LSB2	Bit 15..8
3	8 Bit LSB1	Bit 7..0

Example: 1.0 = 0x3F800000

Table 38. Format 3 - Floating Point 32 Bit

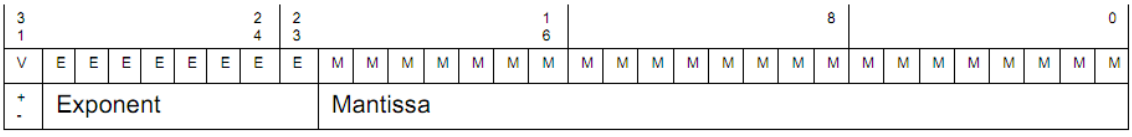


Figure 2. IEEE Floating Point 32 Bit

Byte	Description	Comment
0	8 Bit Exponent	$10^{Exponenet}$
1	8 Bit Value	-128…+127

Example: -12.3

= $-123 * 10^{-1}$

= 0xFF85

Table 39. Format 4 - Signed 8 Bit with Exponent

Byte	Description	Comment
0	8 Bit Exponent	$10^{Exponenet}$
1	8 Bit MSB	Bit 15..8
2	8 Bit LSB	Bit 7..0

Example: -23.568

= $-23568 * 10^{-3}$

= 0xFDA3F0

Table 40. Format 5 - Signed 16 Bit with Exponent

Byte	Description	Comment
0	8 Bit Exponent	$10^{Exponenet}$
1	8 Bit MSB2	Bit 31..24
2	8 Bit MSB1	Bit 23..16
3	8 Bit LSB2	Bit 15..8
4	8 Bit LSB1	Bit 7..0

Example: -239.4785

= $-2394785 * 10^{-4}$

= 0xFCFE9295B4

Table 41. Format 6 - Signed 32 Bit with Exponent

6 DECIMAL TO SIGNED CONVERSION TABLES

Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex
-128	80	-77	B3	-26	E6	25	19	76	4C
-127	81	-76	B4	-25	E7	26	1A	77	4D
-126	82	-75	B5	-24	E8	27	1B	78	4E
-125	83	-74	B6	-23	E9	28	1C	79	4F
-124	84	-73	B7	-22	EA	29	1D	80	50
-123	85	-72	B8	-21	EB	30	1E	81	51
-122	86	-71	B9	-20	EC	31	1F	82	52
-121	87	-70	BA	-19	ED	32	20	83	53
-120	88	-69	BB	-18	EE	33	21	84	54
-119	89	-68	BC	-17	EF	34	22	85	55
-118	8A	-67	BD	-16	F0	35	23	86	56
-117	8B	-66	BE	-15	F1	36	24	87	57
-116	8C	-65	BF	-14	F2	37	25	88	58
-115	8D	-64	C0	-13	F3	38	26	89	59
-114	8E	-63	C1	-12	F4	39	27	90	5A
-113	8F	-62	C2	-11	F5	40	28	91	5B
-112	90	-61	C3	-10	F6	41	29	92	5C
-111	91	-60	C4	-9	F7	42	2A	93	5D
-110	92	-59	C5	-8	F8	43	2B	94	5E
-109	93	-58	C6	-7	F9	44	2C	95	5F
-108	94	-57	C7	-6	FA	45	2D	96	60
-107	95	-56	C8	-5	FB	46	2E	97	61
-106	96	-55	C9	-4	FC	47	2F	98	62
-105	97	-54	CA	-3	FD	48	30	99	63
-104	98	-53	CB	-2	FE	49	31	100	64
-103	99	-52	CC	-1	FF	50	32	101	65
-102	9A	-51	CD	0	0	51	33	102	66
-101	9B	-50	CE	1	1	52	34	103	67
-100	9C	-49	CF	2	2	53	35	104	68
-99	9D	-48	D0	3	3	54	36	105	69
-98	9E	-47	D1	4	4	55	37	106	6A
-97	9F	-46	D2	5	5	56	38	107	6B
-96	A0	-45	D3	6	6	57	39	108	6C
-95	A1	-44	D4	7	7	58	3A	109	6D
-94	A2	-43	D5	8	8	59	3B	110	6E
-93	A3	-42	D6	9	9	60	3C	111	6F
-92	A4	-41	D7	10	A	61	3D	112	70
-91	A5	-40	D8	11	B	62	3E	113	71
-90	A6	-39	D9	12	C	63	3F	114	72
-89	A7	-38	DA	13	D	64	40	115	73
-88	A8	-37	DB	14	E	65	41	116	74
-87	A9	-36	DC	15	F	66	42	117	75
-86	AA	-35	DD	16	10	67	43	118	76
-85	AB	-34	DE	17	11	68	44	119	77
-84	AC	-33	DF	18	12	69	45	120	78
-83	AD	-32	E0	19	13	70	46	121	79
-82	AE	-31	E1	20	14	71	47	122	7A
-81	AF	-30	E2	21	15	72	48	123	7B
-80	B0	-29	E3	22	16	73	49	124	7C
-79	B1	-28	E4	23	17	74	4A	125	7D
-78	B2	-27	E5	24	18	75	4B	126	7E
								127	7F

Table 42. Decimal to 8 Bit Signed Lookup

7 NOTES

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