Symetrix

322 DSP Engine

CONTROL PROTOCOL

322 DSP Engine
Command Protocol

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Introduction

About this document

The purpose of this document is to provide a technical understanding of the Symetrix 322 DSP Engine Command Protocol. It will define and illustrate the data string structure used to communicate with the 322 via a serial RS-232 or RS-485.

Conventions used in this document

A dollar sign "$" preceding a set of two alphanumeric characters denotes a hex value. All other number values should be considered decimal values. Ex., "**$A0**" represents the decimal value of "160".

Getting Started

Data string format

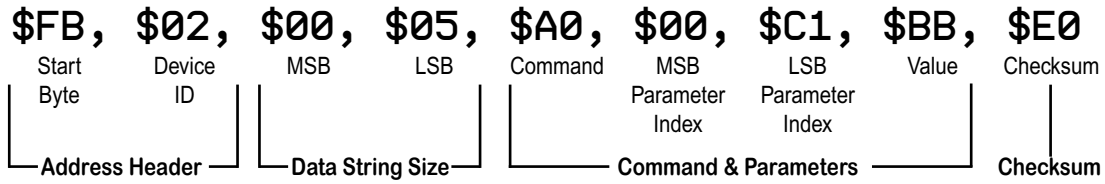
We can say, for purposes of illustration, that the data string is made up of three parts; the address header, the MSB and LSB byte count. The address header consists of the address escape byte, <$FB>, and the number of the addressed unit, <$ADDR>. The <$FB> signals the beginning of a data string as well as an escape for the end of one. Anywhere a <$FB> byte is present in the outgoing data stream, it must be escaped with another <$FB> byte to indicate that the byte is to be treated as a data value and not the address mark. This additional escape byte is not factored into the checksum. The <$ADDR> is the unit ID number ($01–$FA or 1-250; an address of $00 or 0 is used for global or "broadcast" type commands). The MSB and LSB byte count indicate the number of bytes to follow (not including any <$FB> escape bytes). The MSB and LSB together are treated as a 16 bit unsigned quantity, the MSB being the upper byte and the LSB the lower. The MSB will always be zero unless the command stream is more than 255 bytes long.

Here is another way to look at it:

PART	LENGTH	DESCRIPTION
Address Header	2 bytes	byte 1: Escape byte <$FB> byte 2: Device Address <$ADDR> ($01–$FA or 1-250; 0 = global)
Data String Size	2 bytes	byte 1: MSB = normally zero (see above paragraph) byte 2: LSB = Command (1 byte) + Parameters (nn bytes) + Checksum (1 byte)
Command & Parameters	1 byte nn bytes	For example, **$A0 (Send Parameter Data)** Format and size varies by command type (See Parameter Indexes, pages 18-23)
Checksum	1 byte	See **Checksum** on page 6

Data string construction

An example command string: Set Ch. 1 input gain to maximum level using **$A0 Send Parameter Data**.



An example return status string: No error.

Returned codes

Returned status codes (PA-422 ANNEX A defined):

- **$00**: no error
- **$01**: invalid data
- **$02**: invalid command code
- **$03**: device locked
- **$04**: device not locked
- **$05**: channel(s) muted
- **$06**: channel(s) not muted

322 specific status codes:

- **$07**: checksum error
- **$10**: EEPROM write error
- **$12**: invalid password
- **$13**: command failed
- **$14**: password required
- **$15**: insufficient dsp resources to add a new module

Device type codes:

- **$32**: 322 2X2 DSP Engine

Manufacture's code

- **$38**: Symetrix

Checksum

The checksum is the 2's complement of the LSB byte of the (32 bit internal) checksum. To compute the checksum, ignore the initial <**$FB**> and <**$ADDR**> bytes of the string so you are left with the MSB, LSB, command, and parameter data. Add the remaining bytes. Here is a simple formula:

sum = sum AND **$FF** :make sure the sum is less than **$100** (256 in decimal)
checksum = **$100** - sum :take the two's complement of sum

Example:
Data String with out checksum: **$FB, $01, $00, $04, $A0, $04, $BB** (251, 1, 0, 4, 160, 4, 187 in decimal)
Remove FB and address bytes: **$00, $04, $A0, $04, $BB** (0, 4, 160, 4, 187 in decimal)
Add remaining bytes: **$163** (355 in decimal)
Ignore all but the bottom byte: **$63** (99 in decimal)
Two's compliment: **$9D** (157 in decimal)
Data String with checksum: **$FB, $01, $00, $04, $A0, $04, $BB, $9D** (251, 1, 0, 4, 160, 4, 187, 157 in decimal)

General Notes

Unit addressing

The rear dip switch defines the unit number by multiplying by two (i.e. switch setting 1 = unit number <**$02**>). In the case of a 322EX, if a slave 322 is connected, as defined by the connectors chosen when connecting the Cat-5 cable between the units, it adds 1 to the unit number defined by the dip switch. Thus a two unit pair with both dip switch unit numbers set to 2, the master will be addressed by commands to unit <**$04**> and the slave will be addressed by commands sent to unit <**$05**>.

Timing

Because all other host processing is suspended during communication it is necesssary to pace the repetitive commands like the **Real Time Data** command to allow some processing between the data strings to take place. Typically, requesting a real time update every 100mS is plenty fast for a GUI update and leaves the 322 sufficient time for internal processing. This is only important when the 322 is operating near 100% load.

Commands

$82 Load Program - Loads a program into the edit buffer
Example: Load program 1
<$FB, $02, $00, $03, $82, $01, $7A>

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$82		command
$nn		memory number (1- 4)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$83 Set Program Pointer - deferred load program
Note: Receiving a global load program command (address mark + unit address of 0) will load the program number set in this command if it is nonzero. See Command: **Global Load Program** on page 17.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$83		command
$nn		program pointer (0 = off, 1-8 = program memory)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$85 Lock device

Lock states are controlled by setting bits in the lock word that is 16 bits long (for future expandibility). A set bit enables the appropriate lock.

For the remote interface and rear panel inputs

BIT	Function
0	Disables program stores
1	Changes to the edit buffer are disabled except for output level control
2	Changes to the edit buffer output level parameters are disabled
3	Program loads from RS232/RS485 are disabled

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$19		(LSB) including command and checksum
$85		command
$nn		password (16 bytes, 0 filled)
...		(If no password was stored in the device, this field is ignored)
$nn		rear/remote lock level bit map
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all sent bytes)

$86 Unlock Device

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$22		(LSB) including command and checksum
$86		command
$nn		password (16 bytes, 0 filled)
...		(If no password was stored in the device, this field is ignored)
$78		checksum (of all sent bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$87 Mute output(s)

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$87		command
$nn		bit mapped to output channel (Bit 0 set = Channel 1 muted, Bit 1 set = Channel 2 muted)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$88 Unmute output(s)

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$88		command
$nn		bit mapped to output channel (Bit 0 set = Channel 1 unmuted, Bit 1 set = Channel 2 unmuted)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$89 Mute all outputs

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$89		command
$75		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$8A Unmute all outputs

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$8A		command
$8C		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$93 Save program
Note: Two consecutive saves of program 255 will initialize all programs and global parameters.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$93		command
$nn		program number to save to
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$94 Set System Data
Note: any field filled with zeros uses the current value

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$50		(LSB) bytes to follow
$94		command
$nn		16 character old password
...		
$nn		16 character new password
...		If 16 null's, then password not altered
$nn		16 character device name
...		If 16 null's, then name not altered
$nn		program to run on powerup. (0 = last program, 1-4 = presets 1-4)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$96 Bypass Relay Control

If bit 0 is set in the control byte then the first bypass relay will be energized. Similarly, if bit 1 is set, the second bypass relay will be energized. Note that the actual signal being bypassed is dependent on internally set jumpers. An energized relay causes signal to be taken from the DAC.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$03		(LSB) including status and checksum
$96		command
$nn		bypass relay control byte
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$97 Set Rear Baud Rate

This command changes the baud rate after the checksum has been sent. The command only affects the rear control port, the front remains always at 38400 Baud. The data value refers to one of five different baud settings:

0 = 9600
1 = 19200
2 = 38400
3 = 57600
4 = 115200

Any value outside this range has no effect. The baud is set to 38400 after a factory initialization.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$03		(LSB) including status and checksum
$97		command
$nn		baud rate index (see above)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$9B Set the Min/Max Range for Analog Control(s)

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$06		(LSB) bytes to follow
$9B		command
$nn		ADC 1 minimum (0-255)
$nn		ADC 1 maximum (0-255)
$nn		ADC 2 minimum (0-255)
$nn		ADC 2 maximum (0-255)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$9C Toggle RS-485 Master/Slave Status On/Off

Note: State is not maintained over power cycles and must be reestablished at each new connection. If there is another controller on the RS-485 network then it must be disabled for the duration of the front panel connection. Also, this command is only executable from the front panel connection. The purpose of this command is to allow a 322 to become, in effect, an RS-232 to RS-485 converter and drive an isolated bus connecting multiple 322's through their rear RS-485 connections.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$03		(LSB) bytes to follow
$9C		command
$nn		master/slave status (0 = slave, 1 = master)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum

$A0 Send Parameter Data
Example: Sets Channel 1's input gain to maximum level.
<$FB, $02, $00, $05, $A0, $00, $C1, $BB, $E0>

Note: If the parameter index number is 254 then the command will receive all of the GUI storage space data as a block.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$nn		(MSB) number of bytes to follow
$nn		(LSB) including command, data and checksum
$A0		command
$nn		(MSB) starting parameter index number
$nn		(LSB) starting parameter index number
$nn		parameter data starting with
...		given index
$nn		last parameter byte
$nn		checksum
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$A1 Send Parameter Data to Preset Storage
Note: If the parameter index number is 254 then the command will receive all of the GUI storage space data as a block.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$nn		(MSB) number of bytes to follow
$nn		(LSB) including command, data and checksum
$A1		command
$nn		program buffer to send to (1-4)
$nn		(MSB) starting parameter index number
$nn		(LSB) starting parameter index number
$nn		parameter data starting with
...		given index, from **Parameter Indexes** on page 18
$nn		last parameter byte
$nn		checksum
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$00 Get Operational Status

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$00		command
$FE		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$05	(LSB) including status and checksum
	$nn	current program pointer (0 = not active)
	$nn	modified status (1 = edit buffer modified)
	$nn	last error status (0 if none)
	$nn	returned status
	$nn	checksum (of all returned bytes)

$02 Get Device Type and Device ID Codes

Note: This command is typically used for discovery purposes.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$02		command
$FC		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$12 Get Software Statistics

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$12		command: return software status
$EC		checksum
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$41	(LSB) including status and checksum
	$nn	16 byte password
	...	
	$nn	16 byte device name
	...	
	$nn	revision number *100, MSB
	$nn	revision number, LSB
	$nn	day
	$nn	month
	$nn	year (20<nn>)
	$nn	rear/remote lock level
	$nn	power-up program (0 = last operating state, 1-4 = presets 1-4, $FF = don't change)
	$nn	return status
	$nn	checksum (of all returned bytes)

$20 Receive Parameter Data

Note: executing this command resets the 'EBCHANGED_LOCAL' (bit1) flag in the realtime status command. If the parameter index number is 254 then the command will send all of the GUI storage space as a block.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$07		(LSB) including command and checksum
$20		command
$nn		buffer to read from (0 = edit, 1-4 = programs)
$nn		(MSB) starting parameter index number
$nn		(LSB) starting parameter index number
$nn		(MSB) number of parameters to read
$nn		(LSB) number of parameters to read
...		parameters up to the last available
$nn		checksum
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$nn	(MSB) number of bytes to follow
	$nn	(LSB) including status and checksum
	$nn	data, ordered according to the table on page 18
	...	
	$nn	returned status
	$nn	checksum (of all returned bytes)

$21 Read Analog Control Data

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$02		(LSB) including command and checksum
$21		command
$DD		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$06	(LSB) including status and checksum
	$nn	ADC 1 minimum (0-255)
	$nn	ADC 1 maximum (0-255)
	$nn	ADC 2 minimum (0-255)
	$nn	ADC 2 maximum (0-255)
	$nn	returned status
	$nn	checksum

$22 Get Real-Time Status

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$22		command: get realtime data
$DC		checksum

<Continued>

SEND	RECEIVE	DESCRIPTION
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow,
	$34	(LSB) including status and checksum
	$nn	master/slave status (0 = master, 1 = slave)
	$nn	DSP load (0-200 in 0.5% steps)

Note: Level values are 0.5dB/step below 0dBFS. Compression attenuation is 0.5dB/step below 0dBFS. I.E., a level of -10dBFS would return a value of 20 or <$14>.

$nn	gain monitor 1 output
$nn	gain monitor 2 output
$nn	gain monitor 3 output
$nn	gain monitor 4 output
$nn	ch 1 input level
$nn	ch 2 input level
$nn	ch 3 input level
$nn	ch 4 input level
$nn	ch 1 output level
$nn	ch 2 output level
$nn	ch 3 output level
$nn	ch 4 output level

Note: Compression metrics are offset by 48dB. A returned value of 0 indicates 48dB of gain, a returned value of 96 indicates 0dB.

$nn	compressor 1, 1st section/lowpass gain reduction
$nn	compressor 1, 2nd section/hipass gain reduction
$nn	compressor 2, 1st section/lowpass gain reduction
$nn	compressor 2, 2nd section/hipass gain reduction
$nn	raw analog control input 1 (range of external pot = 0-255 or <$00 - $FF>)
$nn	raw analog control input 2 (range of external pot = 0-255 or <$00 - $FF>)

Map of overload status bits. The bit is set if in overload, cleared after 3 seconds of inactivity.

	BIT	MODULE
$nn	0	parametric 1
	1	parametric 2
	2	parametric 3
	3	parametric 4
	4	parametric 5
	5	parametric 6
	6	parametric 7
	7	parametric 8
$nn	0	parametric 9
	1	parametric 10
	2	parametric 11
	3	parametric 12
	4	parametric 13
	5	parametric 14
	6	parametric 15
	7	parametric 16
$nn	0	compressor 1 1st section
	1	compressor 1 2nd section
	2	compressor 2 1st section
	3	compressor 2 2nd section
	4	shelf 1
	5	shelf 2
	6	shelf 3
	7	shelf 4

<Continued>

SEND	RECEIVE	DESCRIPTION
	$nn 0	summer 1
	1	summer 2
	2	low pass 1
	3	low pass 2
	4	hi pass 1
	5	hi pass 2
	6	crossover
	7	anti feedback 1
	$nn 0	anti feedback 2
	1	input 1
	2	input 2
	3	input 3
	4	input 4
	5	output 1
	6	output 2
	7	output 3
	$nn 0	output 4
	1	small speaker eq 1
	2	small speaker eq 2
	4	Gate 1 closed
	5	Gate 2 closed
	6	ARM1 signal is above threshold
	7	ARM2 signal is above threshold
	$nn	current program

Note: The “Changed Flag” bit will be reset upon the next execution of the command **$20 Read Program Paramter Data**, see page 15.

$nn	Edit buffer changed flag Bit 0 set = Edit buffer changed since last status read
$nn	System settings changed flag Bit 0 set = changed since last **$12 Get Software Statistics** command
$nn	Bypass/mute status Bit 0 set indicates channel 1 is bypassed Bit 1 set indicates channel 2 is bypassed Bit 2 set indicates channel 1 is muted Bit 3 set indicates channel 2 is muted

Gate attenuation is 0.5dB/step below 0dBFS

$nn	Gate 1 gain reduction
$nn	Gate 2 gain reduction
$nn	return status
$nn	checksum (of all returned bytes)

Global Load Program

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$00		broadcast address 0 (load program pointed to by program pointer)

Parameter Definitions

Parameter Indexes
Note: Each module takes up no DSP processing time until the signal source is set to a value other than 'Null Input' <**$00**>. A module should be removed from a signal path by setting its signal source to null, thus removing its dsp load as well.

Parametric EQ: 16 Instances

Index	Function	Mapping table	Notes
$00	Parametric 1 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$01	Parametric 1 frequency	Freq1	
$02	Parametric 1 band width	Bw1	
$03	Parametric 1 gain	Gain2	
$04	Parametric 2 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$05	Parametric 2 frequency	Freq1	
$06	Parametric 2 band width	Bw1	
$07	Parametric 2 gain	Gain2	
$08	Parametric 3 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$09	Parametric 3 frequency	Freq1	
$0A	Parametric 3 band width	Bw1	
$0B	Parametric 3 gain	Gain2	
$0C	Parametric 4 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$0D	Parametric 4 frequency	Freq1	
$0E	Parametric 4 band width	Bw1	
$0F	Parametric 4 gain	Gain2	
$10	Parametric 5 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$11	Parametric 5 frequency	Freq1	
$12	Parametric 5 band width	Bw1	
$13	Parametric 5 gain	Gain2	
$14	Parametric 6 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$15	Parametric 6 frequency	Freq1	
$16	Parametric 6 band width	Bw1	
$17	Parametric 6 gain	Gain2	
$18	Parametric 7 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$19	Parametric 7 frequency	Freq1	
$1A	Parametric 7 band width	Bw1	
$1B	Parametric 7 gain	Gain2	
$1C	Parametric 8 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$1D	Parametric 8 frequency	Freq1	
$1E	Parametric 8 band width	Bw1	
$1F	Parametric 8 gain	Gain2	
$20	Parametric 9 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$21	Parametric 9 frequency	Freq1	
$22	Parametric 9 band width	Bw1	
$23	Parametric 9 gain	Gain2	
$24	Parametric 10 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$25	Parametric 10 frequency	Freq1	
$26	Parametric 10 band width	Bw1	
$27	Parametric 10 gain	Gain2	

<Continued>

Index	Function	Mapping table	Notes
$28	Parametric 11 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$29	Parametric 11 frequency	Freq1	
$2A	Parametric 11 band width	Bw1	
$2B	Parametric 11 gain	Gain2	
$2C	Parametric 12 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$2D	Parametric 12 frequency	Freq1	
$2E	Parametric 12 band width	Bw1	
$2F	Parametric 12 gain	Gain2	
$30	Parametric 13 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$31	Parametric 13 frequency	Freq1	
$32	Parametric 13 band width	Bw1	
$33	Parametric 13 gain	Gain2	
$34	Parametric 14 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$35	Parametric 14 frequency	Freq1	
$36	Parametric 14 band width	Bw1	
$37	Parametric 14 gain	Gain28	
$38	Parametric 15 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$39	Parametric 15 frequency	Freq1	
$3A	Parametric 15 band width	Bw1	
$3B	Parametric 15 gain	Gain2	
$3C	Parametric 16 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$3D	Parametric 16 frequency	Freq1	
$3E	Parametric 16 band width	Bw1	
$3F	Parametric 16 gain	Gain2	

Low Pass Filters: 2 Instances

Index	Function	Mapping table	Notes
$40	Low Pass 1 signal source	Sigsrc1	Setting bit 7 puts the lowpass into bypass mode
$41	Low Pass 1 gain trim	Gain5	
$42	Low Pass 1 frequency	Freq1	
$43	Low Pass 1 slope	Slope1	
$44	Low Pass 2 signal source	Sigsrc1	Setting bit 7 puts the lowpass into bypass mode
$45	Low Pass 2 gain trim	Gain5	
$46	Low Pass 2 frequency	Freq1	
$47	Low Pass 2 slope	Slope1	

High Pass Filters: 2 Instances

Index	Function	Mapping table	Notes
$48	Hi Pass 1 signal source	Sigsrc1	Setting bit 7 puts the hipass into bypass mode
$49	Hi Pass 1 gain trim	Gain5	
$4A	Hi Pass 1 frequency	Freq1	
$4B	Hi Pass 1 slope	Slope1	
$4C	Hi Pass 2 signal source	Sigsrc1	Setting bit 7 puts the hipass into bypass mode
$4D	Hi Pass 2 gain trim	Gain5	
$4E	Hi Pass 2 frequency	Freq1	
$4F	Hi Pass 2 slope	Slope1	

Delay: 2 Instances

Note: Delay is updated 100mS after any delay length parameter is written. Maximum delay is 16384 samples (0x4000, 0.372 seconds)

Index	Function	Mapping table	Notes
$50	Delay 1 signal source	Sigsrc1	Setting bit 7 puts the delay into bypass mode
$51	Delay 1 delay msb		
$52	Delay 1 delay mid		
$53	Delay 1 delay lsb		
$54	Delay 2 signal source	Sigsrc1	Setting bit 7 puts the delay into bypass mode
$55	Delay 2 delay msb		
$56	Delay 2 delay mid		
$57	Delay 2 delay lsb		

Gate/Expander: 2 Instances

Note: The Gate module is stereo. If used in a mono, mode set the unused input to null source <$00>. Setting bit 7 in the signal source parameter forces bypass mode. It is possible to monitor the effect of the sidechain filters by using the gate sidechain output monitors, Sigsrc1 offsets <$2D> through <$30>.

Index	Function	Mapping table	Notes
$58	Gate 1 signal source A	Sigsrc1	Setting bit 7 forces gate bypass mode
$59	Gate 1 signal source B	Sigsrc1	Setting bit 7 forces gate bypass mode
$5A	Gate 1 threshold	Thresh1	
$5B	Gate 1 depth	Thresh1	
$5C	Gate 1 attack	TcTable3	
$5D	Gate 1 release	TcTable3	
$5E	Gate 1 sidechain lowpass freq	Freq1	
$5F	Gate 1 sidechain hipass freq	Freq1	
$60	Gate 2 signal source A	Sigsrc1	Setting bit 7 forces gate bypass mode
$61	Gate 2 signal source B	Sigsrc1	Setting bit 7 forces gate bypass mode
$62	Gate 2 threshold	Thresh1	
$63	Gate 2 depth	Thresh1	
$64	Gate 2 attack	TcTable3	
$65	Gate 2 release	TcTable3	
$66	Gate 2 sidechain lowpass freq	Freq1	
$67	Gate 2 sidechain hipass freq	Freq1	

Compressor: 2 Instances

Notes:
1. Each compressor is a stereo module. If the module is used in a monophonic mode set the unused input to the null Sigsrc1 index <$00>.
2. There are three operating modes for the module. This is set in the opmode parameter:
   0 = Dual band. Each of the compressors inside the module act on different parts of the spectrum, set by the crossover frequency parameter. This parameter is ignored if the compressor isn't operating in mode 0.
   1 = Single fullband. Only the first section is operational.
   2 = Series fullband. Both sections of the compressor operate in series.
3. The sidechain mode parameter affects the first compressor in series mode or the only compressor in single mode. It allows converting the first section into either an AGC or an expander. In the AGC mode, the makeup gain parameter is automatically controlled, and the threshold control becomes the target level parameter.

Index	Function	Mapping table	Notes
$68	Compressor 1 signal source A	Sigsrc1	Setting bit 7 bypasses entire compressor
$69	Compressor 1 signal source B	Sigsrc1	
$6A	Compressor 1 signal delay	<$00-$84>	0 - 3mS, in 22.68uS sample increments
$6B	Compressor 1 crossover freq	Freq1	only active in dual band mode
$6C	Compressor 1 threshold	Thresh1	low pass/first section goal level in ARM mode
$6D	Compressor 1 knee	Knee1	low pass/first section
$6E	Compressor 1 ratio	Ratio1	low pass/first section
$6F	Compressor 1 attack time	TcTable1	low pass/first section
$70	Compressor 1 hold time	TcTable2	low pass/first section
$71	Compressor 1 release time	TcTable2	low pass/first section
$72	Compressor 1 makeup gain	Gain2	low pass/first section, +24dB added to table value
$73	Compressor 1 threshold	Thresh1	hi pass/second section
$74	Compressor 1 knee	Knee1	hi pass/second section
$75	Compressor 1 ratio	Ratio1	hi pass/second section
$76	Compressor 1 attack time	TcTable1	hi pass/second section
$77	Compressor 1 hold time	TcTable2	hi pass/second section
$78	Compressor 1 release time	TcTable2	hi pass/second section
$79	Compressor 1 makeup gain	Gain2	hi pass/second section, +24dB added to table
$7A	Compressor 1 operating mode		0: dual band, 1: single band, 2: series

Note: setting bit 7 in the 'sidechain mode' parameter enables a series high pass filter in the first compressor section's sidechain, setting bit 6 enables a high pass in the second section's sidechain

$7B	Compressor 1 sidechain mode		0: normal, 1: AGC ARM enabled, 2: expander mode
$7C	Compressor 1 ARM threshold	Thresh1	'autosense' level
$7D	Compressor 2 signal source A	Sigsrc1	
$7E	Compressor 2 signal soruce B	Sigsrc1	
$7F	Compressor 2 signal delay	<$00-$84>	0-3mS in 22.68uS sample increments
$80	Compressor 2 crossover freq	Freq1	only active in dual band mode
$81	Compressor 2 threshold	Thresh1	low pass/first section goal level in ARM mode
$82	Compressor 2 knee	Knee1	low pass/first section
$83	Compressor 2 ratio	Ratio1	low pass/first section
$84	Compressor 2 attack time	TcTable1	low pass/first section
$85	Compressor 2 hold time	TcTable2	low pass/first section
$86	Compressor 2 release time	TcTable2	low pass/first section
$87	Compressor 2 makeup gain	Gain2	low pass/first section, +24dB added to table value
$88	Compressor 2 threshold	Thresh1	hi pass/second section
$89	Compressor 2 knee	Knee1	hi pass/second section
$8A	Compressor 2 ratio	Ratio1	hi pass/second section
$8B	Compressor 2 attack time	TcTable1	hi pass/second section
$8C	Compressor 2 hold time	TcTable2	hi pass/second section
$8D	Compressor 2 release time	TcTable2	hi pass/second section
$8E	Compressor 2 makeup gain	Gain2	hi pass/second section, +24dB added to table
$8F	Compressor 2 operating mode		0: dual band, 1: single band, 2: series

Note: setting bit 7 in the 'sidechain mode' parameter enables a series high pass filter in the first compressor section's sidechain, setting bit 6 enables a high pass in the second section's sidechain

$90	Compressor 2 sidechain mode		0: normal, 1: AGC ARM enabled, 2: expander mode
$91	Compressor 2 ARM threshold	Thresh1	'autosense' level

Summer/Mixer: 2 Instances

Index	Function	Mapping table	Notes
$92	Signal Source 1	Sigsrc1	
$93	Signal Source 1 Gain	Gain3	
$94	Signal Source 2	Sigsrc1	
$95	Signal Source 2 Gain	Gain3	
$96	Signal Source 1	Sigsrc1	
$97	Signal Source 1 Gain	Gain3	
$98	Signal Source 2	Sigsrc1	
$99	Signal Source 2 Gain	Gain3	

Shelving Filter: 4 Instances

Index	Function	Mapping table	Notes
$9A	Shelf 1 signal source	Sigsrc1	Setting bit 7 bypasses filter
$9B	Shelf 1 input gain trim	Gain5	
$9C	Shelf 1 mode		0: Low Shelf, 1: High Shelf
$9D	Shelf 1 freq	Freq1	
$9E	Shelf 1 gain	Gain5	
$9F	Shelf 2 signal source	Sigsrc1	Setting bit 7 bypasses filter
$A0	Shelf 2 input gain trim	Gain5	
$A1	Shelf 2 mode		0: Low Shelf, 1: High Shelf
$A2	Shelf 2 freq	Freq1	
$A3	Shelf 2 gain	Gain5	
$A4	Shelf 3 signal source	Sigsrc1	Setting bit 7 bypasses filter
$A5	Shelf 3 input gain trim	Gain5	
$A6	Shelf 3 mode		0: Low Shelf, 1: High Shelf
$A7	Shelf 3 freq	Freq1	
$A8	Shelf 3 gain	Gain5	
$A9	Shelf 4 signal source	Sigsrc1	Setting bit 7 bypasses filter
$AA	Shelf 4 input gain trim	Gain5	
$AB	Shelf 4 mode		0: Low Shelf, 1: High Shelf
$AC	Shelf 4 freq	Freq1	
$AD	Shelf 4 gain	Gain5	

Crossover: 1 Instance

Index	Function	Mapping table	Notes
$AE	Crossover 1 signal source	Sigsrc1	
$AF	Crossover 1 lo pass frequency	Freq1	Linkwitz/Riley mode links Low and High Pass Filters
$B0	Crossover 1 hi pass frequency	Freq1	
$B1	Crossover 1 low pass delay	<$00-$84>	0-3mS, in 22.68uS sample increments
$B2	Crossover 1 low pass phase		0: Normal, 1: Inverted
$B3	Crossover 1 low pass gain trim	Gain5	
$B4	Crossover 1 hi pass delay	<$00-$84>	0-3mS, in 22.68uS sample increments

Note: setting the top bit in this phase parameter enables the compensating horn EQ.

$B5	Crossover 1 hi pass phase		0: Normal, 1: Inverted
$B6	Crossover 1 hi pass gain trim	Gain5	

<Continued>

Note: The top 4 bits specify filter type (0000 = Butterworth, 0001 = Linkwitz/Riley, 0010 = Bessel, 0011 = Elliptic). For the Linkwitz/Riley case, only 24 and 48 dB/octave slopes are allowed. If an illegal slope is given for the L-R case the slope command will be ignored.

Index	Function	Mapping table	Notes
$B7	Crossover 1 low pass slope	Slope2	
$B8	Crossover 1 high pass slope	Slope2	

Input Gain

Index	Function	Mapping table	Notes
$C1	Input 1 gain	Gain3	
$C2	Input 2 gain	Gain3	

Output Source and Gain

Index	Function	Mapping table	Notes
$C3	Output 1 signal source	Sigsrc1	
$C4	Output 1 gain	Gain3	
$C5	Output 2 signal source	Sigsrc1	
$C6	Output 2 gain	Gain3	

Rear ADC Control Inputs

Note: Destination parameter is the index of a parameter in the following table. Parameters controlling signal source are ignored. To control one of the delay modules, use the LSB parameter <$53> or <$57>. The value sent will be left shifted 6 bits to generate the final delay value. Minimum and maximum index values vary according to the table used by the controlled parameter. The 322 will handle mapping the range of the input voltage to the table range in real time. A value of 255 or <$FF> in the destination field disables that control.

Index	Function	Mapping table	Notes
$CB	Rear Control 1 destination 1		
$CC	Rear Control 1 minimum index 1		
$CD	Rear Control 1 maximum index 1		
$CE	Rear Control 1 destination 2		
$CF	Rear Control 1 minimum index 2		
$D0	Rear Control 1 maximum index 2		
$D1	Rear Control 1 destination 3		
$D2	Rear Control 1 minimum index 3		
$D3	Rear Control 1 maximum index 3		
$D4	Rear Control 1 destination 4		
$D5	Rear Control 1 minimum index 4		
$D6	Rear Control 1 maximum index 4		
$D7	Rear Control 2 destination 1		
$D8	Rear Control 2 minimum index 1		
$D9	Rear Control 2 maximum index 1		
$DA	Rear Control 2 destination 2		
$DB	Rear Control 2 minimum index 2		
$DC	Rear Control 2 maximum index 2		
$DD	Rear Control 2 destination 3		
$DE	Rear Control 2 minimum index 3		
$DF	Rear Control 2 maximum index 3		
$E0	Rear Control 2 destination 4		
$E1	Rear Control 2 minimum index 4		
$E2	Rear Control 2 maximum index 4		

Test Signals

Note: These are always running, and only need to have a module pointed to their outputs

Index	Function	Mapping table	Notes
$E3	Pink Noise	Thresh1	

Parameter Encoding Tables

TcTable1: Compressor attack time; 0.5ms to 2350ms

$00	0.05ms	$14	11.0ms	$28	31.0ms	$3C	60.0ms	$50	350.0ms
$01	0.1ms	$15	12.0ms	$29	32.0ms	$3D	70.0ms	$51	450.0ms
$02	0.2ms	$16	13.0ms	$2A	33.0ms	$3E	80.0ms	$52	550.0ms
$03	0.3ms	$17	14.0ms	$2B	34.0ms	$3F	90.0ms	$53	650.0ms
$04	0.4ms	$18	15.0ms	$2C	35.0ms	$40	100.0ms	$54	750.0ms
$05	0.5ms	$19	16.0ms	$2D	36.0ms	$41	110.0ms	$55	850.0ms
$06	0.6ms	$1A	17.0ms	$2E	37.0ms	$42	120.0ms	$56	950.0ms
$07	0.7ms	$1B	18.0ms	$2F	38.0ms	$43	130.0ms	$57	1050.0ms
$08	0.8ms	$1C	19.0ms	$30	39.0ms	$44	140.0ms	$58	1150.0ms
$09	0.9ms	$1D	20.0ms	$31	40.0ms	$45	150.0ms	$59	1250.0ms
$0A	1.0ms	$1E	21.0ms	$32	41.0ms	$46	160.0ms	$5A	1350.0ms
$0B	2.0ms	$1F	22.0ms	$33	42.0ms	$47	170.0ms	$5B	1450.0ms
$0C	3.0ms	$20	23.0ms	$34	43.0ms	$48	180.0ms	$5C	1550.0ms
$0D	4.0ms	$21	24.0ms	$35	44.0ms	$49	190.0ms	$5D	1650.0ms
$0E	5.0ms	$22	25.0ms	$36	45.0ms	$4A	200.0ms	$5E	1750.0ms
$0F	6.0ms	$23	26.0ms	$37	46.0ms	$4B	210.0ms	$5F	1850.0ms
$10	7.0ms	$24	27.0ms	$38	47.0ms	$4C	220.0ms	$60	1950.0ms
$11	8.0ms	$25	28.0ms	$39	48.0ms	$4D	230.0ms	$61	2050.0ms
$12	9.0ms	$26	29.0ms	$3A	49.0ms	$4E	240.0ms	$62	2150.0ms
$13	10.0ms	$27	30.0ms	$3B	50.0ms	$4F	250.0ms	$63	2250.0ms
								$64	2350.0ms

TcTable2: Compressor hold/release time; 1ms to 5800ms

$00	1.0ms	$13	20.0ms	$26	39.0ms	$39	130.0ms	$4C	1050.0ms
$01	2.0ms	$14	21.0ms	$27	40.0ms	$3A	140.0ms	$4D	1300.0ms
$02	3.0ms	$15	22.0ms	$28	41.0ms	$3B	150.0ms	$4E	1550.0ms
$03	4.0ms	$16	23.0ms	$29	42.0ms	$3C	170.0ms	$4F	1800.0ms
$04	5.0ms	$17	24.0ms	$2A	43.0ms	$3D	180.0ms	$50	2050.0ms
$05	6.0ms	$18	25.0ms	$2B	44.0ms	$3E	190.0ms	$51	2300.0ms
$06	7.0ms	$19	26.0ms	$2C	45.0ms	$3F	200.0ms	$52	2550.0ms
$07	8.0ms	$1A	27.0ms	$2D	46.0ms	$40	210.0ms	$53	2800.0ms
$08	9.0ms	$1B	28.0ms	$2E	47.0ms	$41	220.0ms	$54	3050.0ms
$09	10.0ms	$1C	29.0ms	$2F	48.0ms	$42	230.0ms	$55	3300.0ms
$0A	11.0ms	$1D	30.0ms	$30	49.0ms	$43	240.0ms	$56	3550.0ms
$0B	12.0ms	$1E	31.0ms	$31	50.0ms	$44	250.0ms	$57	3800.0ms
$0C	13.0ms	$1F	32.0ms	$32	60.0ms	$45	350.0ms	$58	4050.0ms
$0D	14.0ms	$20	33.0ms	$33	70.0ms	$46	450.0ms	$59	4300.0ms
$0E	15.0ms	$21	34.0ms	$34	80.0ms	$47	550.0ms	$5A	4550.0ms
$0F	16.0ms	$22	35.0ms	$35	90.0ms	$48	650.0ms	$5B	4800.0ms
$10	17.0ms	$23	36.0ms	$36	100.0ms	$49	750.0ms	$5C	5050.0ms
$11	18.0ms	$24	37.0ms	$37	110.0ms	$4A	850.0ms	$5D	5300.0ms
$12	19.0ms	$25	38.0ms	$38	120.0ms	$4B	950.0ms	$5E	5550.0ms
								$5F	5800.0ms

TcTable3: Gate rate in dB per ms; 0.1dB/ms to 100dB/ms

$00	0.1ms	$0D	4.0ms	$1A	17.0ms	$27	30.0ms	$34	43.0ms
$01	0.2ms	$0E	5.0ms	$1B	18.0ms	$28	31.0ms	$35	44.0ms
$02	0.3ms	$0F	6.0ms	$1C	19.0ms	$29	32.0ms	$36	45.0ms
$03	0.4ms	$10	7.0ms	$1D	20.0ms	$2A	33.0ms	$37	46.0ms
$04	0.5ms	$11	8.0ms	$1E	21.0ms	$2B	34.0ms	$38	47.0ms
$05	0.6ms	$12	9.0ms	$1F	22.0ms	$2C	35.0ms	$39	48.0ms
$06	0.7ms	$13	10.0ms	$20	23.0ms	$2D	36.0ms	$3A	49.0ms
$07	0.8ms	$14	11.0ms	$21	24.0ms	$2E	37.0ms	$3B	50.0ms
$08	0.9ms	$15	12.0ms	$22	25.0ms	$2F	38.0ms	$3C	60.0ms
$09	1.0ms	$16	13.0ms	$23	26.0ms	$30	39.0ms	$3D	70.0ms
$0A	1.0ms	$17	14.0ms	$24	27.0ms	$31	40.0ms	$3E	80.0ms
$0B	2.0ms	$18	15.0ms	$25	28.0ms	$32	41.0ms	$3F	90.0ms
$0C	3.0ms	$19	16.0ms	$26	29.0ms	$33	42.0ms	$40	100.0ms

Thresh1: -100dB to 0dBFS in 0.5dB steps. Encoded from 0 to 200, where 0 = -100dB.

$00	OFF	$28	−80.5dB	$50	−60.5dB	$78	−40.5dB	$A0	−19.5dB
$01	−100.0dB	$29	−80.0dB	$51	−60.0dB	$79	−40.0dB	$A1	−19.0dB
$02	−99.5dB	$2A	−79.5dB	$52	−59.5dB	$7A	−39.5dB	$A2	−18.5dB
$03	−99.0dB	$2B	−79.0dB	$53	−59.0dB	$7B	−39.0dB	$A3	−18.0dB
$04	−98.5dB	$2C	−78.5dB	$54	−58.5dB	$7C	−38.5dB	$A4	−17.5dB
$05	−98.0dB	$2D	−78.0dB	$55	−58.0dB	$7D	−38.0dB	$A5	−17.0dB
$06	−97.5dB	$2E	−77.5dB	$56	−57.5dB	$7E	−37.5dB	$A6	−16.5dB
$07	−97.0dB	$2F	−77.0dB	$57	−57.0dB	$7F	−37.0dB	$A7	−16.0dB
$08	−96.5dB	$30	−76.5dB	$58	−56.5dB	$80	−36.5dB	$A8	−15.5dB
$09	−96.0dB	$31	−76.0dB	$59	−56.0dB	$81	−36.0dB	$A9	−15.0dB
$0A	−95.5dB	$32	−75.5dB	$5A	−55.5dB	$82	−35.5dB	$AA	−14.5dB
$0B	−95.0dB	$33	−75.0dB	$5B	−55.0dB	$83	−35.0dB	$AB	−14.0dB
$0C	−94.5dB	$34	−74.5dB	$5C	−54.5dB	$84	−34.5dB	$AC	−13.5dB
$0D	−94.0dB	$35	−74.0dB	$5D	−54.0dB	$85	−34.0dB	$AD	−13.0dB
$0E	−93.5dB	$36	−73.5dB	$5E	−53.5dB	$86	−33.5dB	$AE	−12.5dB
$0F	−93.0dB	$37	−73.0dB	$5F	−53.0dB	$87	−33.0dB	$AF	−12.0dB
$10	−92.5dB	$38	−72.5dB	$60	−52.5dB	$88	−32.5dB	$B0	−11.5dB
$11	−92.0dB	$39	−72.0dB	$61	−52.0dB	$89	−32.0dB	$B1	−11.0dB
$12	−91.5dB	$3A	−71.5dB	$62	−51.5dB	$8A	−31.5dB	$B2	−10.5dB
$13	−91.0dB	$3B	−71.0dB	$63	−51.0dB	$8B	−31.0dB	$B3	−10.0dB
$14	−90.5dB	$3C	−70.5dB	$64	−50.5dB	$8C	−30.5dB	$B4	− 9.5dB
$15	−90.0dB	$3D	−70.0dB	$65	−50.0dB	$8D	−30.0dB	$B5	− 9.0dB
$16	−89.5dB	$3E	−69.5dB	$66	−49.5dB	$8E	−29.5dB	$B6	− 8.5dB
$17	−89.0dB	$3F	−69.0dB	$67	−49.0dB	$8F	−29.0dB	$B7	− 8.0dB
$18	−88.5dB	$40	−68.5dB	$68	−48.5dB	$90	−28.5dB	$B8	− 7.5dB
$19	−88.0dB	$41	−68.0dB	$69	−48.0dB	$91	−28.0dB	$B9	− 7.0dB
$1A	−87.5dB	$42	−67.5dB	$6A	−47.5dB	$92	−26.5dB	$BA	− 6.5dB
$1B	−87.0dB	$43	−67.0dB	$6B	−47.0dB	$93	−27.0dB	$BB	− 6.0dB
$1C	−86.5dB	$44	−66.5dB	$6C	−46.5dB	$94	−27.5dB	$BC	− 5.5dB
$1D	−86.0dB	$45	−66.0dB	$6D	−46.0dB	$95	−26.0dB	$BD	− 5.0dB
$1E	−85.5dB	$46	−65.5dB	$6E	−45.5dB	$96	−25.5dB	$BE	− 4.5dB
$1F	−85.0dB	$47	−65.0dB	$6F	−45.0dB	$97	−25.0dB	$BF	− 4.0dB
$20	−84.5dB	$48	−64.5dB	$70	−44.5dB	$98	−24.5dB	$C0	− 3.5dB
$21	−84.0dB	$49	−64.0dB	$71	−44.0dB	$99	−24.0dB	$C1	− 3.0dB
$22	−83.5dB	$4A	−63.5dB	$72	−43.5dB	$9A	−23.5dB	$C2	− 2.5dB
$23	−83.0dB	$4B	−63.0dB	$73	−43.0dB	$9B	−23.0dB	$C3	− 2.0dB
$24	−82.5dB	$4C	−62.5dB	$74	−42.5dB	$9C	−22.5dB	$C4	− 1.5dB
$25	−82.0dB	$4D	−62.0dB	$75	−42.0dB	$9D	−22.0dB	$C5	− 1.0dB
$26	−81.5dB	$4E	−61.5dB	$76	−41.5dB	$9E	−20.5dB	$C6	− 0.5dB
$27	−81.0dB	$4F	−61.0dB	$77	−41.0dB	$9F	−20.0dB	$C7	0.0dB

Ratio1: 1.0 to 6.0 in 0.2 steps. 6.0 to 20.0 in 1.0 steps. Encoded from 0 to 39, where 0 = 1.0 and 39 = 20.0.

$00	1.0	$08	2.6	$10	4.2	$18	5.8	$20	13.0
$01	1.2	$09	2.8	$11	4.4	$19	6.0	$21	14.0
$02	1.4	$0A	3.0	$12	4.6	$1A	7.0	$22	15.0
$03	1.6	$0B	3.2	$13	4.8	$1B	8.0	$23	16.0
$04	1.8	$0C	3.4	$14	5.0	$1C	9.0	$24	17.0
$05	2.0	$0D	3.6	$15	5.2	$1D	10.0	$25	18.0
$06	2.2	$0E	3.8	$16	5.4	$1E	11.0	$26	19.0
$07	2.4	$0F	4.0	$17	5.6	$1F	12.0	$27	20.0

Knee1

$00	24dB (Soft)	$01	12dB (Medium)	$02	0dB (Hard)

Freq1: 16Hz to 19.6kHz in 1/20 octave steps. Encoded from 0 to 205, where 0 = 16Hz and 205 = 19.6kHz.

$00	16.176Hz	$2A	69.348Hz	$54	297.302Hz	$7E	1.274kHz	$A8	5.464kHz		
$01	16.746Hz	$2B	71.794Hz	$55	307.786Hz	$7F	1.319kHz	$A9	5.656kHz		
$02	17.337Hz	$2C	74.325Hz	$56	318.640Hz	$80	1.366kHz	$AA	5.856kHz		
$03	17.948Hz	$2D	76.947Hz	$57	329.877Hz	$81	1.414kHz	$AB	6.062kHz		
$04	18.581Hz	$2E	79.660Hz	$58	341.510Hz	$82	1.464kHz	$AC	6.276kHz		
$05	19.237Hz	$2F	82.469Hz	$59	353.553Hz	$83	1.515kHz	$AD	6.498kHz		
$06	19.915Hz	$30	85.378Hz	$5A	366.021Hz	$84	1.569kHz	$AE	6.727kHz		
$07	20.617Hz	$31	88.388Hz	$5B	378.929Hz	$85	1.624kHz	$AF	6.964kHz		
$08	21.344Hz	$32	91.505Hz	$5C	392.292Hz	$86	1.681kHz	$B0	7.210kHz		
$09	22.097Hz	$33	94.732Hz	$5D	406.126Hz	$87	1.741kHz	$B1	7.464kHz		
$0A	22.876Hz	$34	98.073Hz	$5E	420.448Hz	$88	1.802kHz	$B2	7.727kHz		
$0B	23.683Hz	$35	101.532Hz	$5F	435.275Hz	$89	1.866kHz	$B3	8.000kHz		
$0C	24.518Hz	$36	105.112Hz	$60	450.625Hz	$8A	1.931kHz	$B4	8.282kHz		
$0D	25.383Hz	$37	108.819Hz	$61	466.517Hz	$8B	2.000kHz	$B5	8.574kHz		
$0E	26.278Hz	$38	112.656Hz	$62	482.968Hz	$8C	2.070kHz	$B6	8.876kHz		
$0F	27.205Hz	$39	116.629Hz	$63	500.000Hz	$8D	2.143kHz	$B7	9.189kHz		
$10	28.164Hz	$3A	120.742Hz	$64	517.632Hz	$8E	2.219kHz	$B8	9.513kHz		
$11	29.157Hz	$3B	125.000Hz	$65	535.887Hz	$8F	2.297kHz	$B9	9.849kHz		
$12	30.186Hz	$3C	129.408Hz	$66	554.785Hz	$90	2.378kHz	$BA	10.196kHz		
$13	31.250Hz	$3D	133.972Hz	$67	574.349Hz	$91	2.462kHz	$BB	10.556kHz		
$14	32.352Hz	$3E	138.696Hz	$68	594.604Hz	$92	2.549kHz	$BC	10.928kHz		
$15	33.493Hz	$3F	143.587Hz	$69	615.572Hz	$93	2.639kHz	$BD	11.313kHz		
$16	34.674Hz	$40	148.651Hz	$6A	637.280Hz	$94	2.732kHz	$BE	11.712kHz		
$17	35.897Hz	$41	153.893Hz	$6B	659.754Hz	$95	2.828kHz	$BF	12.125kHz		
$18	37.163Hz	$42	159.320Hz	$6C	683.020Hz	$96	2.928kHz	$C0	12.553kHz		
$19	38.473Hz	$43	164.938Hz	$6D	707.107Hz	$97	3.031kHz	$C1	12.996kHz		
$1A	39.830Hz	$44	170.755Hz	$6E	732.043Hz	$98	3.138kHz	$C2	13.454kHz		
$1B	41.235Hz	$45	176.777Hz	$6F	757.858Hz	$99	3.249kHz	$C3	13.928kHz		
$1C	42.689Hz	$46	183.001Hz	$70	784.584Hz	$9A	3.363kHz	$C4	14.420kHz		
$1D	44.194Hz	$47	189.465Hz	$71	812.252Hz	$9B	3.482kHz	$C5	14.928kHz		
$1E	45.753Hz	$48	196.146Hz	$72	840.896Hz	$9C	3.605kHz	$C6	15.454kHz		
$1F	47.366Hz	$49	203.063Hz	$73	870.551Hz	$9D	3.732kHz	$C7	16.000kHz		
$20	49.037Hz	$4A	210.224Hz	$74	901.250Hz	$9E	3.863kHz	$C8	16.564kHz		
$21	50.766Hz	$4B	217.638Hz	$75	933.033Hz	$9F	4.000kHz	$C9	17.148kHz		
$22	52.566Hz	$4C	225.313Hz	$76	965.936Hz	$A0	4.141kHz	$CA	17.753kHz		
$23	54.409Hz	$4D	233.258Hz	$77	1.000kHz	$A1	4.287kHz	$CB	18.379kHz		
$24	56.328Hz	$4E	241.484Hz	$78	1.035kHz	$A2	4.438kHz	$CC	19.027kHz		
$25	58.315Hz	$4F	250.000Hz	$79	1.071kHz	$A3	4.594kHz	$CD	19.698kHz		
$26	60.371Hz	$50	258.816Hz	$7A	1.109kHz	$A4	4.756kHz				
$27	62.500Hz	$51	267.943Hz	$7B	1.148kHz	$A5	4.924kHz				
$28	64.704Hz	$52	277.392Hz	$7C	1.189kHz	$A6	5.098kHz				
$29	66.986Hz	$53	287.175Hz	$7D	1.231kHz	$A7	5.278kHz				

Bw1: 0.050 to 0.095 in 0.005 octave steps, 0.10 to 3.0 in 0.1 octave steps and 3.0 to 7.0 in 0.2 octave steps.

$00	0.050	$0A	0.10	$14	1.1	$1E	2.1	$28	3.2	$32	5.2
$01	0.055	$0B	0.20	$15	1.2	$1F	2.2	$29	3.4	$33	5.4
$02	0.060	$0C	0.30	$16	1.3	$20	2.3	$2A	3.6	$34	5.6
$03	0.065	$0D	0.40	$17	1.4	$21	2.4	$2B	3.8	$35	5.8
$04	0.070	$0E	0.50	$18	1.5	$22	2.5	$2C	4.0	$36	6.0
$05	0.075	$0F	0.60	$19	1.6	$23	2.6	$2D	4.2	$37	6.2
$06	0.080	$10	0.70	$1A	1.7	$24	2.7	$2E	4.4	$38	6.4
$07	0.085	$11	0.80	$1B	1.8	$25	2.8	$2F	4.6	$39	6.6
$08	0.090	$12	0.90	$1C	1.9	$26	2.9	$30	4.8	$3A	6.8
$09	0.095	$13	1.00	$1D	2.0	$27	3.0	$31	5.0	$3B	7.0

Slope1

$00	12dB/octave (Soft)
$01	24dB/octave (Medium)

Slope2

$00	6dB/octave	$04	30dB/octave
$01	12dB/octave	$05	36dB/octave
$02	18dB/octave	$06	42dB/octave
$03	24dB/octave	$07	48dB/octave

Sigsrc1: Remote Inputs only present in LVDS enabled units with cable attached.

```
$00  Null Input
$01  Channel 1 signal input
$02  Channel 2 signal input
$03  Channel 3 signal input (remote 322 left)
$04  Channel 4 signal input (remote 322 right)
$05  Parametric 1 output
$06  Parametric 2 output
$07  Parametric 3 output
$08  Parametric 4 output
$09  Parametric 5 output
$0A  Parametric 6 output
$0B  Parametric 7 output
$0C  Parametric 8 output
$0D  Parametric 9 output
$0E  Parametric 10 output
$0F  Parametric 11 output
$10  Parametric 12 output
$11  Parametric 13 output
$12  Parametric 14 output
$13  Parametric 15 output
$14  Parametric 16 output
$15  LowPass 1 output
$16  LowPass 2 output
$17  HiPass 1 output
$18  HiPass 1 output
$19  Delay 1 output
$1A  Delay 2 output
$1B  Gate 1 Ch 1 output
$1C  Gate 1 Ch 2 output
$1D  Gate 2 Ch 1 output
$1E  Gate 2 Ch 2 output
$1F  Compressor 1 Ch 1 Output
$20  Compressor 1 Ch 2 Output
$21  Compressor 2 Ch 1 Output
$22  Compressor 2 ch 2 Output
$23  Summer 1 Output
$24  Summer 2 Output
$25  Shelf 1 Output
$26  Shelf 2 Output
$27  Shelf 3 Output
$28  Shelf 4 Output
$29  Crossover 1 Low Output
$2A  Crossover 1 High Output
$2B  Pink Noise
$2C  Null Input
$2D  Gate 1 Ch 1 Sidechain output
$2E  Gate 1 Ch 2 Sidechain output
$2F  Gate 2 Ch 1 Sidechain output
$30  Gate 2 Ch 2 Sidechain output
$31  Small Speaker EQ 1 output
$32  Small Speaker EQ 2 output
```

Gain1: +/- 12dB in 0.5dB steps, encoded from 0 to 48, where 0 = -12.0dB, 24 = 0dB and 48 = +12.0dB.

```
$00  −12.0dB    $0A  − 7.0dB    $14  − 2.0dB    $1E  + 3.0dB    $28  + 8.0dB
$01  −11.5dB    $0B  − 6.5dB    $15  − 1.5dB    $1F  + 3.5dB    $29  + 8.5dB
$02  −11.0dB    $0C  − 6.0dB    $16  − 1.0dB    $20  + 4.0dB    $2A  + 9.0dB
$03  −10.5dB    $0D  − 5.5dB    $17  − 0.5dB    $21  + 4.5dB    $2B  + 9.5dB
$04  −10.0dB    $0E  − 5.0dB    $18    0.0dB    $22  + 5.0dB    $2C  +10.0dB
$05  − 9.5dB    $0F  − 4.5dB    $19  + 0.5dB    $23  + 5.5dB    $2D  +10.5dB
$06  − 9.0dB    $10  − 4.0dB    $1A  + 1.0dB    $24  + 6.0dB    $2E  +11.0dB
$07  − 8.5dB    $11  − 3.5dB    $1B  + 1.5dB    $25  + 6.5dB    $2F  +11.5dB
$08  − 8.0dB    $12  − 3.0dB    $1C  + 2.0dB    $26  + 7.0dB    $30  +12.0dB
$09  − 7.5dB    $13  − 2.5dB    $1D  + 2.5dB    $27  + 7.5dB
```

Gain2: -36dB to +12dB in 0.5dB steps, encoded from 0-96, where 0 = -36.0dB, 72 = 0dB and 96 = +12.0dB.

```
$00  -36.0dB    $14  -26.0dB    $28  -16.0dB    $3C  - 6.0dB    $50  + 4.0dB
$01  -35.5dB    $15  -25.5dB    $29  -15.5dB    $3D  - 5.5dB    $51  + 4.5dB
$02  -35.0dB    $16  -25.0dB    $2A  -15.0dB    $3E  - 5.0dB    $52  + 5.0dB
$03  -34.5dB    $17  -24.5dB    $2B  -14.5dB    $3F  - 4.5dB    $53  + 5.5dB
$04  -34.0dB    $18  -24.0dB    $2C  -14.0dB    $40  - 4.0dB    $54  + 6.0dB
$05  -33.5dB    $19  -23.5dB    $2D  -13.5dB    $41  - 3.5dB    $55  + 6.5dB
$06  -33.0dB    $1A  -23.0dB    $2E  -13.0dB    $42  - 3.0dB    $56  + 7.0dB
$07  -32.5dB    $1B  -22.5dB    $2F  -12.5dB    $43  - 2.5dB    $57  + 7.5dB
$08  -32.0dB    $1C  -22.0dB    $30  -12.0dB    $44  - 2.0dB    $58  + 8.0dB
$09  -31.5dB    $1D  -21.5dB    $31  -11.5dB    $45  - 1.5dB    $59  + 8.5dB
$0A  -31.0dB    $1E  -21.0dB    $32  -11.0dB    $46  - 1.0dB    $5A  + 9.0dB
$0B  -30.5dB    $1F  -20.5dB    $33  -10.5dB    $47  - 0.5dB    $5B  + 9.5dB
$0C  -30.0dB    $20  -20.0dB    $34  -10.0dB    $48    0.0dB    $5C  +10.0dB
$0D  -29.5dB    $21  -19.5dB    $35  - 9.5dB    $49  + 0.5dB    $5D  +10.5dB
$0E  -29.0dB    $22  -19.0dB    $36  - 9.0dB    $4A  + 1.0dB    $5E  +11.0dB
$0F  -28.5dB    $23  -18.5dB    $37  - 8.5dB    $4B  + 1.5dB    $5F  +11.5dB
$10  -28.0dB    $24  -18.0dB    $38  - 8.0dB    $4C  + 2.0dB    $60  +12.0dB
$11  -27.5dB    $25  -17.5dB    $39  - 7.5dB    $4D  + 2.5dB
$12  -27.0dB    $26  -17.0dB    $3A  - 7.0dB    $4E  + 3.0dB
$13  -26.5dB    $27  -16.5dB    $3B  - 6.5dB    $4F  + 3.5dB
```

Gain3: OFF to -90dB to -60dB in 1dB steps. -60dB to +18dB in 0.5dB steps. Encoded from 0 to 187, where 0 = OFF.

$00	OFF	$26	−56.5dB	$4C	−37.5dB	$72	−18.5dB	$98	+ 0.5dB
$01	−90.0dB	$27	−56.0dB	$4D	−37.0dB	$73	−18.0dB	$99	+ 1.0dB
$02	−89.0dB	$28	−55.5dB	$4E	−36.5dB	$74	−17.5dB	$9A	+ 1.5dB
$03	−88.0dB	$29	−55.0dB	$4F	−36.0dB	$75	−17.0dB	$9B	+ 2.0dB
$04	−87.0dB	$2A	−54.5dB	$50	−35.5dB	$76	−16.5dB	$9C	+ 2.5dB
$05	−86.0dB	$2B	−54.0dB	$51	−35.0dB	$77	−16.0dB	$9D	+ 3.0dB
$06	−85.0dB	$2C	−53.5dB	$52	−34.5dB	$78	−15.5dB	$9E	+ 3.5dB
$07	−84.0dB	$2D	−53.0dB	$53	−34.0dB	$79	−15.0dB	$9F	+ 4.0dB
$08	−83.0dB	$2E	−52.5dB	$54	−33.5dB	$7A	−14.5dB	$A0	+ 4.5dB
$09	−82.0dB	$2F	−52.0dB	$55	−33.0dB	$7B	−14.0dB	$A1	+ 5.0dB
$0A	−81.0dB	$30	−51.5dB	$56	−32.5dB	$7C	−13.5dB	$A2	+ 5.5dB
$0B	−80.0dB	$31	−51.0dB	$57	−32.0dB	$7D	−13.0dB	$A3	+ 6.0dB
$0C	−79.0dB	$32	−50.5dB	$58	−31.5dB	$7E	−12.5dB	$A4	+ 6.5dB
$0D	−78.0dB	$33	−50.0dB	$59	−31.0dB	$7F	−12.0dB	$A5	+ 7.0dB
$0E	−77.0dB	$34	−49.5dB	$5A	−30.5dB	$80	−11.5dB	$A6	+ 7.5dB
$0F	−76.0dB	$35	−49.0dB	$5B	−30.0dB	$81	−11.0dB	$A7	+ 8.0dB
$10	−75.0dB	$36	−48.5dB	$5C	−29.5dB	$82	−10.5dB	$A8	+ 8.5dB
$11	−74.0dB	$37	−48.0dB	$5D	−29.0dB	$83	−10.0dB	$A9	+ 9.0dB
$12	−73.0dB	$38	−47.5dB	$5E	−28.5dB	$84	− 9.5dB	$AA	+ 9.5dB
$13	−72.0dB	$39	−47.0dB	$5F	−28.0dB	$85	− 9.0dB	$AB	+10.0dB
$14	−71.0dB	$3A	−46.5dB	$60	−27.5dB	$86	− 8.5dB	$AC	+10.5dB
$15	−70.0dB	$3B	−46.0dB	$61	−27.0dB	$87	− 8.0dB	$AD	+11.0dB
$16	−69.0dB	$3C	−45.5dB	$62	−26.5dB	$88	− 7.5dB	$AE	+11.5dB
$17	−68.0dB	$3D	−45.0dB	$63	−26.0dB	$89	− 7.0dB	$AF	+12.0dB
$18	−67.0dB	$3E	−44.5dB	$64	−25.5dB	$8A	− 6.5dB	$B0	+12.5dB
$19	−66.0dB	$3F	−44.0dB	$65	−25.0dB	$8B	− 6.0dB	$B1	+13.0dB
$1A	−65.0dB	$40	−43.5dB	$66	−24.5dB	$8C	− 5.5dB	$B2	+13.5dB
$1B	−64.0dB	$41	−43.0dB	$67	−24.0dB	$8D	− 5.0dB	$B3	+14.0dB
$1C	−63.0dB	$42	−42.5dB	$68	−23.5dB	$8E	− 4.5dB	$B4	+14.5dB
$1D	−62.0dB	$43	−42.0dB	$69	−23.0dB	$8F	− 4.0dB	$B5	+15.0dB
$1E	−61.0dB	$44	−41.5dB	$6A	−22.5dB	$90	− 3.5dB	$B6	+15.5dB
$1F	−60.0dB	$45	−41.0dB	$6B	−22.0dB	$91	− 3.0dB	$B7	+16.0dB
$20	−59.5dB	$46	−40.5dB	$6C	−21.5dB	$92	− 2.5dB	$B8	+16.5dB
$21	−59.0dB	$47	−40.0dB	$6D	−21.0dB	$93	− 2.0dB	$B9	+17.0dB
$22	−58.5dB	$48	−39.5dB	$6E	−20.5dB	$94	− 1.5dB	$BA	+17.5dB
$23	−58.0dB	$49	−39.0dB	$6F	−20.0dB	$95	− 1.0dB	$BB	+18.0dB
$24	−57.5dB	$4A	−38.5dB	$70	−19.5dB	$96	− 0.5dB		
$25	−57.0dB	$4B	−38.0dB	$71	−19.0dB	$97	0.0dB		

Gain5: -12dB to +12dB in 0.1dB steps.

$00 −12.0dB	$30 − 7.2dB	$60 − 2.4dB	$90 + 2.4dB	$C0 + 7.2dB
$01 −11.9dB	$31 − 7.1dB	$61 − 2.3dB	$91 + 2.5dB	$C1 + 7.3dB
$02 −11.8dB	$32 − 7.0dB	$62 − 2.2dB	$92 + 2.6dB	$C2 + 7.4dB
$03 −11.7dB	$33 − 6.9dB	$63 − 2.1dB	$93 + 2.7dB	$C3 + 7.5dB
$04 −11.6dB	$34 − 6.8dB	$64 − 2.0dB	$94 + 2.8dB	$C4 + 7.6dB
$05 −11.5dB	$35 − 6.7dB	$65 − 1.9dB	$95 + 2.9dB	$C5 + 7.7dB
$06 −11.4dB	$36 − 6.6dB	$66 − 1.8dB	$96 + 3.0dB	$C6 + 7.8dB
$07 −11.3dB	$37 − 6.5dB	$67 − 1.7dB	$97 + 3.1dB	$C7 + 7.9dB
$08 −11.2dB	$38 − 6.4dB	$68 − 1.6dB	$98 + 3.2dB	$C8 + 8.0dB
$09 −11.1dB	$39 − 6.3dB	$69 − 1.5dB	$99 + 3.3dB	$C9 + 8.1dB
$0A −11.0dB	$3A − 6.2dB	$6A − 1.4dB	$9A + 3.4dB	$CA + 8.2dB
$0B −10.9dB	$3B − 6.1dB	$6B − 1.3dB	$9B + 3.5dB	$CB + 8.3dB
$0C −10.8dB	$3C − 6.0dB	$6C − 1.2dB	$9C + 3.6dB	$CC + 8.4dB
$0D −10.7dB	$3D − 5.9dB	$6D − 1.1dB	$9D + 3.7dB	$CD + 8.5dB
$0E −10.6dB	$3E − 5.8dB	$6E − 1.0dB	$9E + 3.8dB	$CE + 8.6dB
$0F −10.5dB	$3F − 5.7dB	$6F − 0.9dB	$9F + 3.9dB	$CF + 8.7dB
$10 −10.4dB	$40 − 5.6dB	$70 − 0.8dB	$A0 + 4.0dB	$D0 + 8.8dB
$11 −10.3dB	$41 − 5.5dB	$71 − 0.7dB	$A1 + 4.2dB	$D1 + 8.9dB
$12 −10.2dB	$42 − 5.4dB	$72 − 0.6dB	$A2 + 4.2dB	$D2 + 9.0dB
$13 −10.1dB	$43 − 5.3dB	$73 − 0.5dB	$A3 + 4.3dB	$D3 + 9.1dB
$14 −10.0dB	$44 − 5.2dB	$74 − 0.4dB	$A4 + 4.4dB	$D4 + 9.2dB
$15 − 9.9dB	$45 − 5.1dB	$75 − 0.3dB	$A5 + 4.5dB	$D5 + 9.3dB
$16 − 9.8dB	$46 − 5.0dB	$76 − 0.2dB	$A6 + 4.6dB	$D6 + 9.4dB
$17 − 9.7dB	$47 − 4.9dB	$77 − 0.1dB	$A7 + 4.7dB	$D7 + 9.5dB
$18 − 9.6dB	$48 − 4.8dB	$78 0.0dB	$A8 + 4.8dB	$D8 + 9.6dB
$19 − 9.5dB	$49 − 4.7dB	$79 + 0.1dB	$A9 + 4.9dB	$D9 + 9.7dB
$1A − 9.4dB	$4A − 4.6dB	$7A + 0.2dB	$AA + 5.0dB	$DA + 9.8dB
$1B − 9.3dB	$4B − 4.5dB	$7B + 0.3dB	$AB + 5.1dB	$DB + 9.9dB
$1C − 9.2dB	$4C − 4.4dB	$7C + 0.4dB	$AC + 5.2dB	$DC +10.0dB
$1D − 9.1dB	$4D − 4.3dB	$7D + 0.5dB	$AD + 5.3dB	$DD +10.1dB
$1E − 9.0dB	$4E − 4.2dB	$7E + 0.6dB	$AE + 5.4dB	$DE +10.2dB
$1F − 8.9dB	$4F − 4.1dB	$7F + 0.7dB	$AF + 5.5dB	$DF +10.3dB
$20 − 8.8dB	$50 − 4.0dB	$80 + 0.8dB	$B0 + 5.6dB	$E0 +10.4dB
$21 − 8.7dB	$51 − 3.9dB	$81 + 0.9dB	$B1 + 5.7dB	$E1 +10.5dB
$22 − 8.6dB	$52 − 3.8dB	$82 + 1.0dB	$B2 + 5.8dB	$E2 +10.6dB
$23 − 8.5dB	$53 − 3.7dB	$83 + 1.1dB	$B3 + 5.9dB	$E3 +10.7dB
$24 − 8.4dB	$54 − 3.6dB	$84 + 1.2dB	$B4 + 6.0dB	$E4 +10.8dB
$25 − 8.3dB	$55 − 3.5dB	$85 + 1.3dB	$B5 + 6.1dB	$E5 +10.9dB
$26 − 8.2dB	$56 − 3.4dB	$86 + 1.4dB	$B6 + 6.2dB	$E6 +11.0dB
$27 − 8.1dB	$57 − 3.3dB	$87 + 1.5dB	$B7 + 6.3dB	$E7 +11.1dB
$28 − 8.0dB	$58 − 3.2dB	$88 + 1.6dB	$B8 + 6.4dB	$E8 +11.2dB
$29 − 7.9dB	$59 − 3.1dB	$89 + 1.7dB	$B9 + 6.5dB	$E9 +11.3dB
$2A − 7.8dB	$5A − 3.0dB	$8A + 1.8dB	$BA + 6.6dB	$EA +11.4dB
$2B − 7.7dB	$5B − 2.9dB	$8B + 1.9dB	$BB + 6.7dB	$EB +11.5dB
$2C − 7.6dB	$5C − 2.8dB	$8C + 2.0dB	$BC + 6.8dB	$EC +11.6dB
$2D − 7.5dB	$5D − 2.7dB	$8D + 2.1dB	$BD + 6.9dB	$ED +11.7dB
$2E − 7.4dB	$5E − 2.6dB	$8E + 2.2dB	$BE + 7.0dB	$EE +11.8dB
$2F − 7.3dB	$5F − 2.5dB	$8F + 2.3dB	$BF + 7.1dB	$EF +11.9dB
				$F0 +12.0dB

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