Third-Party Ethernet Control Manual

Pi / DENEB / DALIM Series

API Version 1.1

(Minimum firmware version v3.4.15)

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INTRODUCTION

The objective of this document is to be a guide to the “third-party” user when communicating with a RAM Audio amplifier via an Ethernet connection.

COMMUNICATION

TCP is the protocol used for communicating a controller device with the amplifiers on an Ethernet network. Each amplifier is assigned a unique IP address on the local network where they will be installed.

All Ethernet-controllable amplifiers leave our factory configured to receive a dynamic IP through a DHCP server. If this server is not present, an auto IP will be assigned using the APIPA protocol. In any case, a manual IP can be configured.

In order to be able to communicate with any of these amplifiers, it is necessary to send the data to the IP mentioned above on the TCP port 1001. In the same way, all amplifiers will respond to the pre-selected IP control (selected by means of a command that will be later referred to).

On the other hand, the Controller must read the incoming TCP packet and extract the IP address that sends this data.

It's important to know that the device only supports one TCP socket.
The device cannot be controlled by two systems at the same time.
The device will not respond to any messages if it has previously been connected to a control system.

DATA TYPE

In the communication between a RAM Audio amplifier and a controller, two types of data are found: the Monitoring Parameters (with which we can obtain the value of parameters like the output tension, the temperature, etc.) and the Control Commands (with which we can modify the value of certain amplifier parameters like the output level or its power-on state). This communication is made by means of data packets, the structure of which will be explained later.

1. Monitoring Parameters (UDP)

1.1. UDP Discovery Device Data

To obtain the device data we send an UDP frame with a single data value 0x58 (‘X’) to the IP: 255.255.255.255 and to port: 65535

The device will respond with an UDP frame with the following data.

Byte	Code	Description
0	0x41	Control value with the character ‘A’
The following bytes indicate the mac address of the device		
1 ..	xx	Decimal value in ASCII code of the 6 digits of the mac ***For a MAC FC:0F:E7:51:36:40 you receive: 32 35 32 2e 31 35 2e 32 33 31 2e 38 31 2e 35 34 2e 36 34 (252.15.231.81.54.64)***
..	0x2f	Data separation character '/'
The following 4 data indicate the data receiving port of the device (1001)		
..	0x31	‘1’
..	0x30	‘0’
..	0x30	‘0’
..	0x31	‘1’
..	0x2f	Data separation character '/'
The next 5 bytes indicate the status of the device		
..	0x4e	‘N’: Programming mode
..	xx	‘0’: Socket State CLOSED ‘1’: Socket State OPEN FAILED, ‘2’: Socket State LISTENING, ‘3’: Socket State CONNECTED, ‘4’: Socket State CLOSING,
..	0x2a	‘*’: Still to be implemented
..	xx	‘M’ : Static Mode ‘I’: DHCP Discovered ‘*’: DHCP Discovering ‘Y’: Static Mode ‘Y’: Auto-IP Mode
	xx	‘C’: Connected with other client ‘*’: Not connected
..	0x2f	Data separation character '/'
The next bytes indicate the IP address		
..	xx	Decimal value in ASCII code of the IP address ***For a IP: 169.254.206.21 you receive: 31 36 39 2e 32 35 34 2e 32 30 36 2e 32 31 34***
..	0x2f	Data separation character '/'
The next bytes indicate the hardware model		
	xx	Characters in ASCII code ***For “DSPBPi” you receive: 44 53 50 42 50 69***
..	0x2f	Data separation character '/'

Byte	Code	Description
The next bytes indicate the device name		
	xx	Characters in ASCII code ***For "NoName" you receive: 4e 6f 4e 61 6d 65***
..	0x2f	Data separation character '/'
The next bytes indicate the device model		
..	xx	Characters in ASCII code ***For "DALIM 14Q" you receive: 44 41 4c 49 4d 20 31 34 51***
..	0x2f	Data separation character '/'
The next bytes indicate the brand name		
..	xx	Characters in ASCII code ***For "RAM Audio" you receive: 52 41 4d 20 41 75 64 69 6f***
..	0x2f	Data separation character '/'
The next bytes indicate the API Version		
..	xx	Characters in ASCII code ***For "1.1" you receive: 31 2e 31***
..	0x2f	Data separation character '/'
The next bytes indicate the Mask Sub-Network		
..	xx	Characters in ASCII code ***For "255.255.255.0" you receive: 32 35 35 2E 32 35 35 2E 32 35 35 2E 30***
..	0x2f	Data separation character '/'

1.2. Real Time values monitor

In parameter monitoring, different data are obtained continuously from the amplifier.
This monitoring can be activated or deactivated at the user's request.
This is a UDP communication.

UDP receive header (when monitor communication is activated)

Byte	Code	Description
0	0x49	
1	0x50	
2	0x41	
3	0x44	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID Size LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x09	Monitor
11	0x00	
12	0x73	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

Data is received in the following order.

Byte	Nº Bytes	Description
16	1	Device input channels
17	1	Device output channels
Input Vumeter *Values from -40 dBu to 20 dBu* *Convert to dBu: (Vumeter Correction/100)+(20*log(Value/65535))*		
18	2	Vumeter Correction (LSB Value: 0x00FF + MSB Value: 0xFF00)
20	2	CH1 vumeter value (LSB Value: 0x00FF + MSB Value: 0xFF00)
22	2	CH2 vumeter value (LSB Value: 0x00FF + MSB Value: 0xFF00)
24	2	CH3 vumeter value (LSB Value: 0x00FF + MSB Value: 0xFF00)
26	2	CH4 vumeter value (LSB Value: 0x00FF + MSB Value: 0xFF00)

Byte	Nº Bytes	Description
Output Vumeter *Values from -40 dBu to 20 dBu* *Convert to dBu: (Vumeter Correction/100)+(20*log(Value/65535))*		
28	2	Vumeter Correction (LSB Value: 0x00FF + MSB Value: 0xFF00)
30	2	CH1 vumeter before dynamics value (LSB Value: 0x00FF + MSB Value: 0xFF00)
32	2	CH1 vumeter after dynamics value (LSB Value: 0x00FF + MSB Value: 0xFF00)
34	2	CH2 vumeter before dynamics value (LSB Value: 0x00FF + MSB Value: 0xFF00)
36	2	CH2 vumeter after dynamics value (LSB Value: 0x00FF + MSB Value: 0xFF00)
38	2	CH3 vumeter before dynamics value (LSB Value: 0x00FF + MSB Value: 0xFF00)
40	2	CH3 vumeter after dynamics value (LSB Value: 0x00FF + MSB Value: 0xFF00)
42	2	CH4 vumeter before dynamics value (LSB Value: 0x00FF + MSB Value: 0xFF00)
44	2	CH4 vumeter after dynamics value (LSB Value: 0x00FF + MSB Value: 0xFF00)
*Analogue Levels (only DENEB / DALIM) *Values from 0V to 150V in models 2.5Q, 5Q and 10Q* *Values from 0V to 235V in models 14Q and 20Q* *Convert to Volts: 0.120043*Volts Value*		
46	1	CH1 Volts sensor calibration Value
47	2	CH1 Volts Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
49	1	CH2 Volts sensor calibration Value
50	2	CH2 Volts Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
52	1	CH3 Volts sensor calibration Value
53	2	CH3Volts Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
55	1	CH4 Volts sensor calibration Value
56	2	CH4 Volts Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
58	2	CH1 Current sensor calibration Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
60	2	CH1 Current Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
62	2	CH2 Current sensor calibration Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
64	2	CH2 Current Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
66	2	CH3 Current sensor calibration Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
68	2	CH3 Current Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
70	2	CH4 Current sensor calibration Value (LSB Value: 0x00FF + MSB Value: 0xFF00)

72	2	CH4 Current Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
Temperature *Values from 0% to 100% (At 100% the device goes into thermal protection)* *Convert to Pi: %=((log((3.3/4096)*Value))*(-112.86)+33.97* *Convert to Deneb / Dalim: %=((log((3.3/4096)*Value))*(-648.16)+165.46*		
74	1	CH1 Temperature sensor calibration Value
75	2	CH1 Temperature Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
77	1	CH2 Temperature sensor calibration Value
78	2	CH2 Temperature Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
80	1	CH3 Temperature sensor calibration Value
81	2	CH3 Temperature Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
83	1	CH4 Temperature sensor calibration Value
84	2	CH4 Temperature Value (LSB Value: 0x00FF + MSB Value: 0xFF00)
Clip (1: Enabled / 0: Disabled)		
86	1	CH1 Clip
87	1	CH2 Clip
88	1	CH3 Clip
89	1	CH4 Clip
Output Level Value		
90	4	CH1 Output Level (LSB Value: 0x00FF + MSB Value: 0xFF00 + Polarity + Mute)
94	4	CH2 Output Level (LSB Value: 0x00FF + MSB Value: 0xFF00 + Polarity + Mute)
98	4	CH3 Output Level (LSB Value: 0x00FF + MSB Value: 0xFF00 + Polarity + Mute)
102	4	CH4 Output Level (LSB Value: 0x00FF + MSB Value: 0xFF00 + Polarity + Mute)
**Fault State, 1 = correct operation (only DENEB / DALIM)		
106	1	CH1 Fault State
107	1	CH2 Fault State
108	1	CH3 Fault State
109	1	CH4 Fault State
RMS Limit Threshold		
110	2	CH1 RMS Limit Threshold (LSB Value: 0x00FF + MSB Value: 0xFF00)
112	2	CH2 RMS Limit Threshold (LSB Value: 0x00FF + MSB Value: 0xFF00)
114	2	CH3 RMS Limit Threshold (LSB Value: 0x00FF + MSB Value: 0xFF00)
116	2	CH4 RMS Limit Threshold (LSB Value: 0x00FF + MSB Value: 0xFF00)
PEAK Limit Threshold		
118	2	CH1 PEAK Limit Threshold (LSB Value: 0x00FF + MSB Value: 0xFF00)

120	2	CH2 PEAK Limit Threshold (LSB Value: 0x00FF + MSB Value: 0xFF00)
122	2	CH3 PEAK Limit Threshold (LSB Value: 0x00FF + MSB Value: 0xFF00)
124	2	CH4 PEAK Limit Threshold (LSB Value: 0x00FF + MSB Value: 0xFF00)
***GPI MUTE Value (only DENEB / DALIM)		
126	1	GPI MUTE Value
Priority Active		
127	1	CH1 Priority Active
128	1	CH2 Priority Active
129	1	CH3 Priority Active
130	1	CH4 Priority Active

In Pi amplifiers this value corresponds to the DSP output level after dynamics
****Pi amps do not have this sensor. The value will always be 1***
*****Pi amps do not have this feature. The value will always be 0***

1.3. Monitoring live data. Message to send

Header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID Size LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x09	**Monitor**
11	0x00	
12	0x0e	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

1.3.1. Enable / Disable Monitors

This is a 14 bytes data and includes the activated monitoring selection, received Port, received IP and received MAC.

RT Header (16 Bytes)	Data (14 Bytes)

Byte	Code	Description
0	0x00 0x01	Monitor Disabled Monitor Enabled
1	0x03	Monitor Port (MSB: 0xFF00)
2	0xea	Monitor Port (LSB: 0x00FF)
3	0xa9	Monitor Target IP
4	0xfe	Monitor Target IP
5	0x17	Monitor Target IP
6	0x0b	Monitor Target IP
7	0x00	Monitor Target MAC
8	0x01	Monitor Target MAC
9	0x02	Monitor Target MAC
10	0x03	Monitor Target MAC
11	0x04	Monitor Target MAC
12	0x05	Monitor Target MAC
13	xx	Monitor Interval Time *(value x100ms)*

Example:
To activate receive monitors in Port:1002 in device with IP: 169.254.23.11, MAC: 00:01:02:03:04:05 and with a monitor reception interval of every 300ms
53 43 4f 4c 01 01 28 00 00 00 09 00 0e 00 00 00 ***01 03 ea a9 fe 17 0b 00 01 02 03 04 05 03***

1.4. Buzz

We send the device identification request. The amplifier display will turn on and off repeatedly.

To ask the amplifier to turn the screen on and off send a udp frame with a single data value 0x42 (‘B’) to the IP device and to port: 65535

1.5. Disconnection requested by device

When the device (amplifier) requests the remote system to disconnect, the device will send a UDP frame with the following header and the value 0xCC in the data. When you receive this communication you must disconnect from the device.

RT Header (16 Bytes)	Data (1 Byte)

Header

Byte	Code	Description
0	0x49	
1	0x50	
2	0x41	
3	0x44	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID Size LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0xC9	Close Connection
11	0x00	
12	0x01	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

Data

Byte	Code	Description
0	0xCC	Close Connection

The remote system receive:
49 50 41 44 01 01 00 00 00 00 C9 00 01 00 00 00 ***CC***

1.6. Automatic connection control system

There are two verification systems used by remote systems to check that the connection is active.

One is TCP Keep-Alive.
When a connection is established, the remote system must create a Keep-Alive routine to periodically check the connection, we recommend running it every 3 seconds.
The amplifier will respond to these Keep-Alive packets.
These Keep-Alive signals activate a routine in the amplifier that, if the response stops, resets the Ethernet connection, closing all connections and putting the amplifier into listening mode, waiting for a new Ethernet connection.
This system is a survival system that activates when communication with the remote system is lost. This prevents an open connection from remaining in the amplifier after a period of no communication.

The second method is the immediate response to the TCP "No Command" instruction.
When an amplifier receives a "No Command" instruction, it immediately responds, without entering any other routine, with a response packet for the remote system to verify that the amplifier is connected.
This system can be configured by the remote control system developer since the amplifier does not perform any action upon receiving these packets, it simply responds to them.

“No Command” Header

Byte	Code	Description
0	0x49	
1	0x50	
2	0x41	
3	0x44	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID Size LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x00	No Command
11	0x00	
12	0x00	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

The device responds:
49 50 41 44 01 01 00 00 00 00 00 00 00 00 00 00

2. Control Commands (TCP)

2.1. General structure of data packets

The data packets consist of a series of bytes and their length will vary according to each case.
In this manual, the bytes are represented in different ways, either in hexadecimal or decimal format.

Real-Time control message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0xXX	**Command**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

2.1.1.Header data

2.1.1.1 Header

For an amplifier to identify a communication as correct, the first 4 bytes of the header always have to be these ones:

Byte	Code	Description
0	0x53	‘S’
1	0x43	‘C’
2	0x4f	‘O’
3	0x4c	‘L’

2.1.1.2 API Version

As of October 25th 2023, the communications API is version 1.1.
If this information is not correct, the amplifier will reject the communication.

2.1.1.3 Message ID

These 4 bytes indicate the number of the instruction message sent by the control software.
This number is generated by the control software and it is the decision of the control software designer to use it.
The amplifier, in its response, will include this number.
The number received by the amplifier cannot be lower than the number received in the last message.
Even if it is not used, the communication structure must be maintained respecting these 4 bytes for the identification number.
To reset the Message ID to 0, simply send MessageID = 0. This is important to do when initiating communication with a device.
If the amplifier has previously established communication with another control system, it will not reject new communications because the Message ID value is lower than the one stored in its memory.

2.1.1.4 Command

Byte 10 determines **Command** requested from the device.
Requested commands can be the following:

Command	Hex Value
Real Time	0x08
Monitor	0x09
Set Device Name	0x0C
Get Library List	0x0F
Set Power Status *	0x10
Recall Snapshot Preset	0x20
Get Device Basic Info	0x23
Get Third Part Info	0xC8

*Set power Status is not available for Pi amps

2.1.1.5 Parameter Size

These two bytes indicate the size of the instruction sent, in number of bytes. This number corresponds to the bytes sent starting with byte 16.

2.1.2.Real-Time structure of data packets

Real-Time control message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x08	**Real Time Command**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

Within the real-time instructions, in byte 16, it is determined which device value we want to change

Byte 16 Hex Value	Value to change
0x03	User Eq
0x1F	User Gain
0x20	User Delay
0x21	Amplifier Volume Level
0x27	User HP
0x28	Route Input Select
0x29	Source Input Select

2.1.2.1 Route Input Select

It is a 7 bytes data and includes the selection of input routing and its value.

RT Header (16 Bytes)	Data (7 Bytes)

Byte	Code	Description
0	0x28	Route Input Select
1	xx	(The same as byte 5)
2	0x00	Matrix Type (Always 0)
3	0x01	Always this value
4	0x04	Always this value
5	0x01 0x02 0x03 0x04	Route CH A Route CH B Route CH C Route CH D
6	0x00 0x01 0x02 0x03 0x04 0x05 0x06	Select Input 1 Select Input 2 Select Input 3 Select Input 4 Select Input 1+2 Select Input 3+4 Select Matrix
7	0xff	Always this value

Example:
To select input 1+2 in route C, send:
53 43 4f 4c 01 01 28 00 00 00 08 00 07 00 00 00 28 ***03 00 01 04 03 04 ff***

2.1.2.2 Source Input Select

This data is 7 bytes and includes the selection of input routing and its value.

RT Header (16 Bytes)	Data (7 Bytes)

Byte	Code	Description
0	0x29	Source Input Select
1	0x01 0x02 0x03 0x04	Channel 1 Channel 2 Channel 3 Channel 4
2	0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09 0x10 0x11	Primary Input Analog 1 Primary Input Analog 2 Primary Input Analog 3 Primary Input Analog 4 Primary Input AES3 1* Primary Input AES3 2* Primary Input AES3 3* Primary Input AES3 4* Primary Input Network** 1* Primary Input Network** 2* Primary Input Network** 3* Primary Input Network** 4*
3	0x00 0x01	Secondary Input is disabled Secondary Input is enable
4	xx	Thershold (value x10). Lower part of the word (0x00FF)
5	xx	Thershold (value x10). Upper part of the word (0xFF00).
6	0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09 0x10 0x11	Secondary Input Analog 1 Secondary Input Analog 2 Secondary Input Analog 3 Secondary Input Analog 4 Secondary Input AES3 1* Secondary Input AES3 2* Secondary Input AES3 3* Secondary Input AES3 4* Secondary Input Network** 1* Secondary Input Network** 2* Secondary Input Network** 3* Secondary Input Network** 4*

**It depens of the amplifier characteristics*
***Refers to any AOIP signal*

Example:
To select the AES3-2 input on the primary source and the Analog-1 input on the secondary with a threshold of -35 dB's on channel 2, send:
53 43 4f 4c 01 01 28 00 00 00 08 00 07 00 00 00 ***29 01 05 01 DD FF 00***

2.1.2.3 User Eq

This data is 10 bytes long.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x03	User Eq
1	0x01 0x02 0x03 0x04	Input 1 Input 2 Input 3 Input 4
2	0x14 0x15 0x16 0x17 0x18 0x19	EQ Band 1 EQ Band 2 EQ Band 3 EQ Band 4 EQ Band 5 EQ Band 6
3	xx	Filter Type (See table below)*
4	xx	Frequency. Lower part of the word (0x00FF)
5	xx	Frequency. Upper part of the word (0xFF00).
6	xx	Gain (value x10). Lower part of the word (0x00FF)
7	xx	Gain (value x10). Upper part of the word (0xFF00).
8	xx	Q (value x10)
9	0x00 0x01	Disable Band Enable Band
10	0x00 0x01	Disable Main Eq Enable Main Eq

Index	Filter Type Description
0x00	Bypass
0x01	Parametric with adapted Q
0x02	Parametric with constant Q
0x03	Low-pass shelving filter 6 dB's
0x04	High-pass shelving filter 6 dB's
0x05	Low-pass shelving filter 12 dB's
0x06	High-pass shelving filter 12 dB's
0x07	Low-pass shelving filter 12 dB's with Q
0x08	High-pass shelving filter 12 dB's with Q
0x09	Low-pass
0x0a	High-pass
0x0b	Low-pass with Q
0x0c	High-pass with Q
0x0d	Band pass
0x0e	Remove band
0x0f	Bypass with 180º offset
0x10	Bypass with 360º offset

Example:
To put in channel 1 input gain of +12dB with normal polarity and unmuted, send:
53 43 4f 4c 01 01 01 00 00 00 08 00 0a 00 00 00 ***1f 01 78 00 00 01***

2.1.2.4 User Input Label

This data is 10 bytes and includes the selection of input label and its value.

RT Header (16 Bytes)	Data (10 Bytes)

Byte	Code	Description
0	0x1A	Change Label
1	0x01 0x02 0x03 0x04	Input Label 1 Input Label 2 Input Label 3 Input Label 4
2	0x06	Label Size (Always this value)
3	0x01	Input Label (Always this value)
4..9	xx	User Input Label in ASCII code

Example:
To change the Input label to *"In A"* in CH 1 send:
53 43 4f 4c 01 01 28 00 00 00 ***08*** *00 07 00 00 00* ***1A 01 06 01 49 4E 20 41 00 00***

2.1.2.5 User Output Label

This data is 10 bytes and includes the selection of output label and its value.

RT Header (16 Bytes)	Data (10 Bytes)

Byte	Code	Description
0	0x1A	Change Label
1	0x01 0x02 0x03 0x04	Output Label 1 Output Label 2 Output Label 3 Output Label 4
2	0x06	Label Size (Always this value)
3	0x09	Output Label (Always this value)
4..9	xx	User Input Label in ASCII code

Example:
To change the Input label to *"Out 1"* in CH 1 send:
53 43 4f 4c 01 01 28 00 00 00 ***08*** *00 07 00 00 00* ***1A 01 06 09 4F 75 74 20 41 00***

2.1.2.6 User input gain

This data is 6 bytes long and includes gain, mute and polarity control.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x1f	User gain
1	0x01 0x02 0x03 0x04	Input Way 1 Input Way 2 Input Way 3 Input Way 4
2	xx	Gain in dB. Lower part of the word (0x00FF). +12.0 to -40.0 dB
3	xx	Gain in dB. Upper part of the word (0xFF00). +12.0 to -40.0 dB
4	0x00 0x01	Normal polarity Inverted polarity
5	0x00 0x01	Muted Unmuted

Example:
To put in channel 1 input gain of +12dB with normal polarity and unmuted, send:
53 43 4f 4c 01 01 01 00 00 00 08 00 0a 00 00 00 ***1f 01 78 00 00 01***

2.1.2.7 User output gain

This data is 6 bytes long and includes gain, mute and polarity control.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x1f	User gain
1	0x10 0x20 0x30 0x40	Output Way 1 Output Way 2 Output Way 3 Output Way 4
2	xx	Gain in dB. Lower part of the word (0x00FF). +120 to -400 (Real value +12.0 to -40.0 dB)
3	xx	Gain in dB. Upper part of the word (0xFF00). +120 to -400 (Real value +12.0 to -40.0 dB)
4	0x00 0x01	Normal polarity Inverted polarity
5	0x00 0x01	Muted Unmuted

Example:
To put in channel 1 output gain of +12dB with normal polarity and unmuted, type:
53 43 4f 4c 01 01 01 00 00 00 08 00 0a 00 00 00 ***1f 10 78 00 00 01***

2.1.2.8 User input delay

This data is 4 bytes long. For channel 1 maximum value is 300.0 ms., for the rest 90.0 ms.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x20	User Delay
1	0x01 0x02 0x03 0x04	Input Way 1 Input Way 2 Input Way 3 Input Way 4
2	xx	Delay value x10. Lower part of the word (0x00FF).
3	xx	Delay value x10. Upper part of the word (0xFF00).

Example:
To put in channel 1 input delay 12.6 ms., send:
53 43 4f 4c 01 01 01 00 00 00 08 00 03 00 00 00 ***20 01 7E 00***

2.1.2.9 User output delay

This data is 4 bytes long. The maximum value is 90.0 ms.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x20	User Delay
1	0x10 0x20 0x30 0x40	Output Way 1 Output Way 2 Output Way 3 Output Way 4
2	xx	Delay value x10. Lower part of the word (0x00FF).
3	xx	Delay value x10. Upper part of the word (0xFF00).

Example:
To put in channel 1 output delay 12,6 ms., send:
53 43 4f 4c 01 01 01 00 00 00 08 00 03 00 00 00 ***20 10 7E 00***

2.1.2.10 Amplifier Volume Level

This data is 6 bytes long and includes gain, mute and polarity control.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x21	Amplifier Volume Level
1	0x10 0x20 0x30 0x40	Output Way 1 Output Way 2 Output Way 3 Output Way 4
2	xx	Gain in dB. Lower part of the word (0x00FF). +120 to -400 (Real value +12.0 to -40.0 dB)
3	xx	Gain in dB. Upper part of the word (0xFF00). +120 to -400 (Real value +12.0 to -40.0 dB)
4	0x00 0x01	Normal polarity Inverted polarity
5	0x00 0x01	Muted Unmuted

Example:
To put in channel 1 level volume gain of +12dB with normal polarity and unmuted, type:
53 43 4f 4c 01 01 01 00 00 00 08 00 0a 00 00 00 ***21 10 78 00 00 01***

2.1.2.11 User HP Filter

This data is 8 bytes long and includes gain, filter type, frequency cut, order and active control.

RT Header (16 Bytes)	Data (8 Bytes)

Byte	Code	Description
0	0x27	HP user filter gain
1	0x01 0x02 0x03 0x04	Input Way 1 Input Way 2 Input Way 3 Input Way 4
2	0x00	0: High Pass
3	 0x00 0x01 0x02	*Xover Type:* Butterworth Linkwitz-Riley Bessel
4	xx	Frequency Cut [20..20000] LSB (0x00FF)
5	xx	Frequency Cut [20..20000] MSB (0xFF00)»8
6	0x00..0x08	Order
7	0x00 0x01	Active Disabled Active Enabled

Example:
To activate the user HP Butterworth filter on channel 1 at a cut-off frequency of 50 Hz with order 4, send:
53 43 4f 4c 01 01 01 00 00 00 08 00 0a 00 00 00 ***27 01 00 00 32 00 04 01***

2.1.2.12 Matrix Values

These data indicate the values of the selected strip matrix

RT Header (16 Bytes)	Data (14 Bytes)

Byte	Code	Description
0	0x28	Matrix Values
1	0x01 0x02 0x03 0x04	Strip 1 Strip 2 Strip 3 Strip 4
2	0x00 0x02	Route Mode (Route Input Select 2.1.2.1) Matrix type custom (always this value to use Matrix Mode)
3	0x01	Number of channels affected by the matrix change (always this value)
4	0x04	Inputs per output (always this value)
5	0x01	Entry number of the process affected by the data change (always this value)
6	xx	Matrix value CH 1 in dB´s (Value x10). Lower part of the word (0x00FF).
7	xx	Matrix value CH 1 in dB´s (Value x10). Upper part of the word (0xFF00).
8	xx	Matrix value CH 2 in dB´s (Value x10). Lower part of the word (0x00FF).
9	xx	Matrix value CH 2 in dB´s (Value x10). Upper part of the word (0xFF00).
10	xx	Matrix value CH 3 in dB´s (Value x10). Lower part of the word (0x00FF).
11	xx	Matrix value CH 3 in dB´s (Value x10). Upper part of the word (0xFF00).
12	xx	Matrix value CH 4 in dB´s (Value x10). Lower part of the word (0x00FF).
13	xx	Matrix value CH 4 in dB´s (Value x10). Upper part of the word (0xFF00).

Example:
If you configure in strip 1, matrix type custom (only is custom), CH1: 0 dB, CH2: -6 dB, CH3: -6 dB, CH4: 0 dB, you send:
53 43 4f 4c 01 01 39 00 00 00 08 00 0e 00 00 00 28 01 02 01 04 01 00 00 c4 ff c4 ff 00 00 ff

2.1.3.Select Snapshot Preset

Select Snapshot Preset message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x20	**Snapshot Recall**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

2.1.3.1 Select number of Snapshot

This data is 1 byte long and includes the number of Snapshot to select.

Snapshot Select Header (16 Bytes)	Data (1 Bytes)

Byte	Code	Description
0	xx	Snapshot preset number (1..20)

Example:
To select the Snapshot number 2, send:
53 43 4f 4c 01 01 00 00 00 00 20 00 01 00 00 00 ***02***

2.1.4.Set Device Name

Set device name message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x0C	**Set Device Name**
11	0x00	
12	0x0e	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

2.1.4.1 Device Name

The device name has a maximum length of 14 characters. Each character corresponds to the ASCII code

Snapshot Select Header (16 Bytes)	Data (1 Bytes)

Byte	Code	Description
0..14	xx	Device Name in ASCII code

Example:
To change the device name to *“Amp2”*, send:
53 43 4f 4c 01 01 00 00 00 00 0C 00 0E 00 00 00 ***41 6D 70 32***

2.1.5.Select On/Off Standby

Select Standby message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x10	**Standby**
11	0x00	
12	0x01	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

2.1.5.1 Select Standby

This data is 1 byte long and includes the select.

Standby Header (16 Bytes)	Data (1 Bytes)

Byte	Code	Description
0	0x00 0x01	Standby Enabled Standby Disabled

Example:
To put the device in Standby, send:
53 43 4f 4c 01 01 00 00 00 00 10 00 01 00 00 00 ***00***

2.1.6.Get Standby Status

Get Standby status message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x11	**Get Standby Status**
11	0x00	
12	0x01	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

2.1.6.1 Heather received when send “Get Standby Status”

Byte	Code	Description
0	0x49	
1	0x50	
2	0x41	
3	0x44	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x11	**Get Standby Status**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

2.1.6.2 Data Received

Byte	Code	Description
16	0x00 0x01 0x02	Standby On Standby Off by Amplifier / Remote control software Standby Off by GPI

2.1.7.Get Device Basic Info

Get device basic info message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x23	**Get Device Basic Info**
11	0x00	
12	0x01	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

Example:
To get the device basic info, send:
53 43 4f 4c 01 01 00 00 00 00 ***23*** *00 01 00 00 00 00*

2.1.7.1 Header received when send “Get Device Basic Info”

Byte	Code	Description
0	0x49	
1	0x50	
2	0x41	
3	0x44	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x23	**Get Device Basic Info**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

2.1.7.2 Data Received

Byte	Code	Description
16	xx	Hardware type
17	xx	Module hardware version
18..33	xx	Serial Number
34..53	xx	Manufacturer name
54..73	xx	Model name
74	0x00 0x01	without AES3 with AES3
75	0x00 0x01	without DANTE / AES67 with DANTE / AES67
76	0x00 0x01	without Voltage sensor with Voltage sensor
77	0x00 0x01	without Impedance sensor with Impedance sensor
78	0x00 0x01	without temperature sensor with temperature sensor
79	0x00 0x01	without standby with standby
80	0x00 0x01	2 channels output 4 channels output

Byte	Code	Description
81	xx	Operation Time in hours. Lower part of the word (0x00FF). +120 to -400 (Real value +12.0 to -40.0 dB)
82	xx	Operation Time in hours. Upper part of the word (0xFF00). +120 to -400 (Real value +12.0 to -40.0 dB)
83	xx	Operation Time in 15 minutes block
84	0x00 0x01	without GPIO with GPIO

2.1.8.Select Get Third Part Info

Select Get Device Data message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0xC8	**Get Third Part Info**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

2.1.8.1 Select Data

This data is 2 bytes long and includes the selected data and the channel to get information.

Get Device Data Header (16 Bytes)	Data (2 Bytes)

Byte	Code	Description
16	0x00	Preset Name
	0x01	Use Name
	0x02	Way Name
	0x03	Snapshot Name
	0x04	Device Name
	0x05	User Input Gain
	0x06	User Output Gain
	0x09	Get Volume
	0x0A	Get Join Select
	0x0B	Get User Eq
	0x0C	Get User Delay
	0x0D	Get Limit Active
	0x0E	User Input Label
	0x0F	User Output Label
	0x10	Primary, Secondary and Routing Input
	0x12	Get Matrix Values
	0x13	Get List User Memories (*No need Channel Description*)
	0x15	Get User HP

Byte	Code	Description
17	0x01	Channel 1
	0x02	Channel 2
	0x03	Channel 3
	0x04	Channel 4

Example:
To get the input data gain from channel 2, send:
53 43 4f 4c 01 01 00 00 00 00 ***C8*** *00 01 00 00 00* ***05 01***

2.1.9.Header received when send "*Get Third Part Info*"

Byte	Code	Description
0	0x49	
1	0x50	
2	0x41	
3	0x44	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0xC8	**Get Third Part Info**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

2.1.9.1 Data Received

This data is of variable length and depends on the information requested

Received message Header (16 Bytes)	Data (variable length)

Preset Name

Byte	Code	Description
16...27	xx	Character in Hex ASCII code

Use Name

Byte	Code	Description
16...27	xx	Character in Hex ASCII code

Way Name

Byte	Code	Description
16...21	xx	Character in Hex ASCII code

Snapshot Name

Byte	Code	Description
16...37	xx	Character in Hex ASCII code

Device Name

Byte	Code	Description
16...23	xx	Character in Hex ASCII code

User Input Gain Data

Byte	Code	Description
16	xx	Gain in dB. Lower part of the word (0x00FF). +120 to -400 (Real value +12.0 to -40.0 dB)
17	xx	Gain in dB. Upper part of the word (0xFF00). +120 to -400 (Real value +12.0 to -40.0 dB)
18	0x00 0x01	Normal polarity Inverted polarity
19	0x00 0x01	Muted Unmuted

User Output Gain Data

Byte	Code	Description
16	xx	Gain in dB. Lower part of the word (0x00FF). +120 to -400 (Real value +12.0 to -40.0 dB)
17	xx	Gain in dB. Upper part of the word (0xFF00). +120 to -400 (Real value +12.0 to -40.0 dB)
18	0x00 0x01	Normal polarity Inverted polarity
19	0x00 0x01	Muted Unmuted

Get Volume

Byte	Code	Description
16	xx	Gain in dB. Lower part of the word (0x00FF). +120 to -400 (Real value +12.0 to -40.0 dB)
17	xx	Gain in dB. Upper part of the word (0xFF00). +120 to -400 (Real value +12.0 to -40.0 dB)
18	0x00 0x01	Normal polarity Inverted polarity
19	0x00 0x01	Muted Unmuted

Get Join Select

Byte	Code	Description
16	0x00 0x01	Disable Join Enable Join

Get User Eq

Byte	Code	Description
16	0x00 0x01	Main Eq disable Main Eq Enable
The equalizer has 6 equalization bands that are received sequentially starting with 1 and ending with 6. The data follows the next order and repeats sequentially for a full channel.		
..	xx	Type *(see table in page 13)*
..	xx	Frequency. Lower part of the word (0x00FF).
..	xx	Frequency. Upper part of the word (0xFF00).
..	xx	Gain (x10). Lower part of the word (0x00FF).
..	xx	Gain (x10). Upper part of the word (0xFF00).
..	xx	Q value (x10)
..	0x00 0x01	Eq Band Disable Eq Band Enable

The frame, without the header, has a total length of 43 bytes

Get User Delay

Byte	Code	Description
16	xx	Delay (x10). Lower part of the word (0x00FF).
17	xx	Delay (x10). Upper part of the word (0xFF00).

Get Limit Active

Byte	Code	Description
16	0x00 0x01	RMS Limit Disable RMS Limit Enable
17	0x00 0x01	PEAK Limit Disable PEAK Limit Enable

User Input Label

Byte	Code	Description
16...21	xx	Character in Hex ASCII code

User Output Label

Byte	Code	Description
16...21	xx	Character in Hex ASCII code

Primary, Secondary and Routing Input

Byte	Code	Description
16	0x00..0x03 0x04..0x07 0x08..0x11	Analog Primary Input 1 to 4 AES3 Primary Input 1 to 4 Dante/AES67 Primary Input 1 to 4
17	0x00..0x03 0x04..0x07 0x08..0x11 0xFF	Analog Secondary Input 1 to 4 AES3 Secondary Input 1 to 4 Dante/AES67 Secondary Input 1 to 4 Priority Select Disable
18	0x00 0x01 0x02 0x03 0x04 0x05 0x06	Input 1 Select Input 2 Select Input 3 Select Input 4 Select Input 1+2 Select Input 3+4 Select Matrix Select
19	xx	Priority threshold in dB´s (Value x10). Lower part of the word (0x00FF).
20	xx	Priority threshold in dB´s (Value x10). Upper part of the word (0xFF00).

Example:
If you send input data gain from channel 2:
53 43 4f 4c 01 01 00 00 00 00 ***C8*** *00 01 00 00 00* ***05 01***

You receive, Gain = +7 dB, Normal polarity and Unmuted:
49 50 41 44 01 01 00 00 00 00 ***C8*** *00* ***04*** *00 00 00* ***46 00 01 01***

Get Matrix Values

Byte	Code	Description
16	0x00 0x01	Basic Matrix Custom Matrix
17	xx	Matrix value CH 1 in dB´s (Value x10). Lower part of the word (0x00FF).
18	xx	Matrix value CH 1 in dB´s (Value x10). Upper part of the word (0xFF00).
19	xx	Matrix value CH 2 in dB´s (Value x10). Lower part of the word (0x00FF).
20	xx	Matrix value CH 2 in dB´s (Value x10). Upper part of the word (0xFF00).
21	xx	Matrix value CH 3 in dB´s (Value x10). Lower part of the word (0x00FF).
22	xx	Matrix value CH 3 in dB´s (Value x10). Upper part of the word (0xFF00).
23	xx	Matrix value CH 4 in dB´s (Value x10). Lower part of the word (0x00FF).
24	xx	Matrix value CH 4 in dB´s (Value x10). Upper part of the word (0xFF00).

Example:
If you send get matrix values from CH 1
53 43 4f 4c 01 01 00 00 00 00 ***C8*** *00 01 00 00 00* ***12 01***

You receive, Matrix type: basic, CH1 Gain: 0 dB´s, CH2 Gain: -40 dB´s, CH3 Gain: -40 dB´s, CH4 Gain: -40 dB´s
49 50 41 44 01 01 00 00 00 00 ***C8*** *00 04 00 00 00* ***00 00 00 70 FE 70 FE 70 FE***

Get List User Memories

Byte	Data	Description
16	**‘U’**	Indicates that the name of a memory has to be received
17	xx	Number of memory
18...	xx	Name of memory
..	‘\0’	At the end of the text a null character will be received

This data structure continues until all the names of the user memories on the amplifier are complete.

Get User HP

Byte	Code	Description
16	0x00 0x01 0x02	Filter type Butterworth Filter type Bessel Filter type Linkwitz-Riley
17	xx	Frequency. Lower part of the word (0xFF00).
18	xx	Frequency. Upper part of the word (0xFF00).
19	0x01..0x08	Order
20	0x00 0x01	Disable Enable

2.1.10. Select Get Library List

Select Get Device Data message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x0F	**Get Library List**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

Example:
To get the different name presets, send:
*53 43 4f 4c 01 01 00 00 00 00 0**F** 00 01 00 00 00 **00***

2.1.11. Header received when send "*Get Library List*"

In a first data transmission, the received header indicates the number of data that are going to be received (Params size)

Byte	Code	Description
0	0x49	
1	0x50	
2	0x41	
3	0x44	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF000000) » 24
10	0x0F	**Get Library List**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

In the following communications the names of the different presets are sent.

2.1.11.1 Data Received

You will receive a frame with the following characteristics

Byte	Data	Description
16	**‘S’**	Indicates that the name of a snapshot has to be received
17	xx	Number of snapshot
18...	xx	Name of Snapshot
..	‘\0’	At the end of the text a null character will be received

This data structure continues until all the names of the snapshots present on the amplifier are complete.

When a first data with the character **'P'** is received, it will indicate that the next name is that of an amplifier system preset. The same data reception structure will continue as for Snapshots.

Byte	Data	Description
..	**‘P’**	Indicates that the name of a system Preset is to be received
..	xx	Number of system Preset
..	xx	Name of System Preset
..	‘\0’	At the end of the text a null character will be received

After receiving the null character (/0) indicating the end of the preset name, the following bytes indicate

Byte	Data	Description
..	xx	Number of uses
..	xx	Number of ways
..	0x00 0x01	Join protect disable Join protect enable
	0x00 0x01	User In protect disable User In protect enable
	0x00 0x01	User Out protect disable User Out protect enable

Once this data is received, the control system first receives the names of the uses (as many times as indicated in the number of uses) and then the names of the ways (indicated in the number of ways).

Byte	Data	Description
..	**‘u’**	Indicates that the name of a use is to be received
..	xx	Name of use
..	‘\0’	At the end of the text a null character will be received

Byte	Data	Description
..	**‘w’**	Indicates that the name of a way is to be received
..	xx	Name of Way
..	‘\0’	At the end of the text a null character will be received

If you receive the following data frame:

49 50 41 44 01 01 00 00 00 00 0F 00 23 00 00 00 ***53 01 44 69 72 65 63 74 20 4f 75 74 00 53 02 42 61 73 69 63 20 4d 6f 6e 6f 20 28 31 20 69 6e 20 34 29 00***

You receive names of Snapshots
1. “Direct Out”
2. “Basic Mono (1 in 4)” If you receive the following data frame:

3. Control Groups

This section describes the group controls for RAM Audio amplifiers. The devices feature the following adjustable group controls:

- Input gain, mute, and phase inversion for each channel
- Output gain, mute, and phase inversion for each channel
- Input delay control (cumulative to the device's maximum per-channel values)
- Output delay control (cumulative to the device's maximum per-channel values)
- 19 input IIR equalization filters

Group control parameters are managed in the same way that we manage real-time parameters.

3.1. General structure of data packets

3.1.1. Control Group real time commands

Control Group message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x08	**Real Time Command**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

Within the real-time instructions, in byte 16, it is determined which device value we want to change

Byte 16 Hex Value	Value to change
0x12	Gain Group
0x13	Delay group
0x14	Geq Group

3.1.1.1 Group input gain

This data is 6 bytes long and includes gain, mute and polarity control.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x12	Group gain
1	0x01 0x02 0x03 0x04	Input Way 1 Input Way 2 Input Way 3 Input Way 4
2	xx	Gain in dB. Lower part of the word (0x00FF). +12.0 to -40.0 dB
3	xx	Gain in dB. Upper part of the word (0xFF00). +12.0 to -40.0 dB
4	0x00 0x01	Normal polarity Inverted polarity
5	0x00 0x01	Muted Unmuted

Example:
To put in channel 1 input group gain of +12dB with normal polarity and unmuted, send:
53 43 4f 4c 01 01 01 00 00 00 08 00 0a 00 00 00 ***12 01 78 00 00 01***

3.1.1.2 Group output gain

This data is 6 bytes long and includes gain, mute and polarity control.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x12	Group gain
1	0x10 0x20 0x30 0x40	Output Way 1 Output Way 2 Output Way 3 Output Way 4
2	xx	Gain in dB. Lower part of the word (0x00FF). +120 to -400 (Real value +12.0 to -40.0 dB)
3	xx	Gain in dB. Upper part of the word (0xFF00). +120 to -400 (Real value +12.0 to -40.0 dB)
4	0x00 0x01	Normal polarity Inverted polarity
5	0x00 0x01	Muted Unmuted

Example:
To put in channel 1 output group gain of +12dB with normal polarity and unmuted, type:
53 43 4f 4c 01 01 01 00 00 00 08 00 0a 00 00 00 ***12 10 78 00 00 01***

3.1.1.3 Group input delay

This data is 4 bytes long. For channel 1 maximum value is 300.0 ms., for the rest 90.0 ms.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x13	Group Delay
1	0x01 0x02 0x03 0x04	Input Way 1 Input Way 2 Input Way 3 Input Way 4
2	xx	Delay value x10. Lower part of the word (0x00FF).
3	xx	Delay value x10. Upper part of the word (0xFF00).

Example:
To put in channel 1 input delay 12.6 ms., send:
53 43 4f 4c 01 01 01 00 00 00 08 00 03 00 00 00 ***13 01 7E 00***

3.1.1.4 Group output delay

This data is 4 bytes long. The maximum value is 90.0 ms.

RT Header (16 Bytes)	Data (6 Bytes)

Byte	Code	Description
0	0x13	User Delay
1	0x10 0x20 0x30 0x40	Output Way 1 Output Way 2 Output Way 3 Output Way 4
2	xx	Delay value x10. Lower part of the word (0x00FF).
3	xx	Delay value x10. Upper part of the word (0xFF00).

Example:
To put in channel 1 output delay 12,6 ms., send:
53 43 4f 4c 01 01 01 00 00 00 08 00 03 00 00 00 ***13 10 7E 00***

3.1.1.5 Group Eq

This data is 10 bytes long.

RT Header (16 Bytes)	Data (11 Bytes)

Byte	Code	Description
0	0x14	Group Eq
1	0x01 0x02 0x03 0x04	Input 1 Input 2 Input 3 Input 4
2	0x00 --- 0x13	Group EQ Band 1 --- Group EQ Band 19
3	xx	Filter Type (See table below)*
4	xx	Frequency. Lower part of the word (0x00FF)
5	xx	Frequency. Upper part of the word (0xFF00).
6	xx	Gain (value x10). Lower part of the word (0x00FF)
7	xx	Gain (value x10). Upper part of the word (0xFF00).
8	xx	Q (value x10)
9	0x00 0x01	Disable Band Enable Band
10	0x00 0x01	Disable Main Eq Enable Main Eq

Index	Filter Type Description
0x00	Bypass
0x01	Parametric with adapted Q
0x02	Parametric with constant Q
0x03	Low-pass shelving filter 6 dB's
0x04	High-pass shelving filter 6 dB's
0x05	Low-pass shelving filter 12 dB's
0x06	High-pass shelving filter 12 dB's
0x07	Low-pass shelving filter 12 dB's with Q
0x08	High-pass shelving filter 12 dB's with Q
0x09	Low-pass
0x0a	High-pass
0x0b	Low-pass with Q
0x0c	High-pass with Q
0x0d	Band pass
0x0e	Remove band
0x0f	Bypass with 180º offset
0x10	Bypass with 360º offset

Example:
To put in channel 1 input gain of +12dB with normal polarity and unmuted, send:
53 43 4f 4c 01 01 01 00 00 00 08 00 0a 00 00 00 ***14 01 78 00 00 01***

3.1.2. Control Group get values

The device is capable of reporting the group values assigned to the amplifier.

To generate the device's response with the values, it is necessary to send the following instruction.

Important: The response exceeds the device's response data buffer. This causes the data to be sent from the device to the control system using two communication frames.

Get Group values message header

Byte	Code	Description
0	0x53	
1	0x43	
2	0x4f	
3	0x4c	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x14	**Get Group Values**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

3.1.2.1 Data Received

Byte	Code	Description
0	0x49	
1	0x50	
2	0x41	
3	0x44	
4	0x01	API Version
5	0x01	API Version
6	0x00	Message ID LSB (0x000000FF)
7	0x00	Message ID (0x0000FF00) » 8
8	0x00	Message ID (0x00FF0000) » 16
9	0x00	Message ID MSB (0xFF0000) » 24
10	0x14	**Get Group Values**
11	0x00	
12	0x0a	Params Size LSB (0x000000FF)
13	0x00	Params Size MSB (0x0000FF00) » 8
14	0x00	
15	0x00	

Received message Header (16 Bytes)	Data (542 Bytes)

Number of channels

Byte	Code	Description
16	xx	Input channels
17	xx	Output channels

Group Input Gain Data channel 1

Byte	Code	Description
17	xx	Gain in dB. Lower part of the word (0x00FF). +120 to -400 (Real value +12.0 to -40.0 dB)
18	xx	Gain in dB. Upper part of the word (0xFF00). +120 to -400 (Real value +12.0 to -40.0 dB)
19	0x00 0x01	Normal polarity Inverted polarity
20	0x00 0x01	Muted Unmuted

This data structure is repeated for the other three channels, accumulating 12 more bytes.

Get Group Input Delay channel 1

Byte	Code	Description
33	xx	Delay (x10). Lower part of the word (0x00FF).
34	xx	Delay (x10). Upper part of the word (0xFF00).

This data structure is repeated for the other three channels, accumulating 6 more bytes.

Get Group Input Eq channel 1

Byte	Code	Description
41	0x00 0x01	Main Eq disable Main Eq Enable
The groups has 19 equalization bands that are received sequentially starting with 1 and ending with 19. The data follows the next order and repeats sequentially for a full channel.		
..	xx	Type *(see table in page 49)*
..	xx	Frequency. Lower part of the word (0x00FF).
..	xx	Frequency. Upper part of the word (0xFF00).
..	xx	Gain (x10). Lower part of the word (0x00FF).
..	xx	Gain (x10). Upper part of the word (0xFF00).
..	xx	Q value (x10)
..	0x00 0x01	Eq Band Disable Eq Band Enable

This data structure is repeated for the other three channels, accumulating 402 more bytes.

Get Group Output Gain Data channel 1

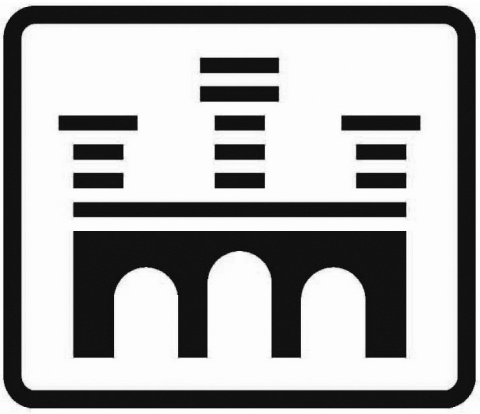
Byte	Code	Description
536	xx	Gain in dB. Lower part of the word (0x00FF). +120 to -400 (Real value +12.0 to -40.0 dB)
537	xx	Gain in dB. Upper part of the word (0xFF00). +120 to -400 (Real value +12.0 to -40.0 dB)
538	0x00 0x01	Normal polarity Inverted polarity
539	0x00 0x01	Muted Unmuted

This data structure is repeated for the other three channels, accumulating 12 more bytes.

Get Group Output Delay channel 1

Byte	Code	Description
551	xx	Delay (x10). Lower part of the word (0x00FF).
552	xx	Delay (x10). Upper part of the word (0xFF00).

This data structure is repeated for the other three channels.



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